CHAPTER 4
WASTEWATER

C4.1 SCOPE

This Chapter contains criteria to control and regulate discharges of wastewaters into surface waters. This includes, but is not limited to, storm water runoff associated with industrial activities, domestic and industrial wastewater discharges, and pollutants from indirect dischargers.

C4.2 DEFINITIONS

2-hour mixed sample. A sample drawn continuously over a period of 2 hours, or mixture of several samples, all drawn continuously or discretely over a period of 2 hours.

7-day Average. The arithmetic mean of the values of pollutant parameters for samples collected in a period of 7 consecutive days.

24-hour mixed sample. A sample drawn continuously over a period of 24 hours, or a composite sample drawn over a period of 24 hours.

30-day Average. The arithmetic mean of the values of pollutant parameters for samples collected in a period of 30 consecutive days.

AOX. Sum parameter of adsorbable organically bound halogens.

Average Monthly Discharge Limitations. The highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

Average Weekly Discharge Limitation. The highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

Best Management Practices (BMPs). Practical practices and procedures that will minimize or eliminate the possibility of pollution being introduced into waters of the host nation.

BOD_5. The 5-day measure of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The pollutant parameter is biochemical oxygen demand (i.e., biodegradable organics in terms of oxygen demand).

$CBOD_5$. The 5-day measure of the pollutant parameter, carbonaceous biochemical oxygen demand. This test can substitute for the BOD_5 testing which suppresses the nitrification reaction/component in the BOD_5 test.

COD. Chemical Oxygen Demand. The measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant.

Daily Discharge. The "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with

limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement (e.g. concentration) "daily discharge" is calculated as the average measurement of the pollutant over the day.

DIN. German industrial standards. These standards describe methodologies or requirements for construction and use of certain equipment or instruments. If DIN Numbers are cited within the FGS, these DINs shall be considered.

Direct Discharge. Any "discharge of pollutants" other than an indirect discharge.

Discharge of a Pollutant. Any addition of any pollutant or combination of pollutants to waters of host nation from any "point source."

Domestic Wastewater Treatment System (DWTS). Any DoD or host nation facility designed to treat wastewater before its discharge to waters of the host nation and in which the majority of such wastewater is made up of domestic sewage.

Effluent Limitation. Any restriction imposed on quantities, discharge rates, and concentrations of pollutants that are ultimately discharged from point sources into waters of the host nation.

EW. Citizen equivalent that corresponds to a wastewater pollution load of 60 grams (g) of BOD_5 per day (the size categorization of domestic wastewater treatment facilities is based on this unit).

Flow proportional sample. A sample collected based on the wastewater volume. The greater the wastewater inflow, the larger the sample volume that is required, and the greater number of samples are required to be collected. The sampling can be conducted either by using the pass-method for continuous measurements or by pulse regulation for non-continuous measurements.

Indirect Discharge. An introduction of pollutants in process wastewater to a domestic wastewater treatment system (DWTS).

Industrial Activities Associated with Storm Water. Activities that during wet weather events may contribute pollutants to storm water runoff or drainage. (See Table C4.T3.)

Industrial Wastewater. See Process Wastewater.

Industrial Wastewater Treatment System (IWTS). Any DoD facility designed to treat process wastewater before its discharge to waters of the host nation other than a DWTS.

Installation. A base, camp, post, station, yard, center, or other activity under the jurisdiction of the Secretary of a Military Department that is located outside the United States and outside any territory, Commonwealth, or possession of the United States.

Interference. Any addition of any pollutant or combination of pollutant discharges that inhibits or disrupts the DWTS, its treatment processes or operations, or its sludge handling processes, use or disposal.

LHKW. Easily volatile halogenated hydrocarbons. The sum of trichloethene, tetrachlorethene, 1,1,1,-trichlorethane, and dichlormethane calculated as chlorine.

Maximum Daily Discharge Limitation. The highest allowable daily discharge based on volume as well as concentration.

MCL. Maximum contaminant level.

Operator. Any person who owns, leases, operates, controls, or supervises a facility.

Pass Method (Flow Proportional Sample). A composite sample that is created by taking equal volumes of discrete samples during the examination period (e.g., 2 hours, 24 hours) at a frequency proportional to the current flow.

Point Source. Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock; but not including vessels, aircraft or any conveyance that merely collects natural surface flows of precipitation.

Pollutant. Includes, but is not limited to, the following: dredged spoil; solid waste; incinerator residue; filter backwash; sewage; garbage; sewage sludge; munitions; chemical wastes; biological materials; radioactive materials; heat; wrecked or discarded equipment; rock; sand; cellar dirt; and industrial, municipal, and agricultural waste discharged into water.

Process Wastewater. Any water that during manufacturing or processing, comes into direct contact with, or results from the production or use of, any raw material, intermediate product, finished product, by-product, or waste product.

Pulse Method (Flow Proportional Sample). A composite sample that is created by taking discrete sample volumes in equal time intervals during the examination period (e.g., 2 hours, 24 hours). The discrete sample volumes are proportional with the current flow.

Qualified random sample. A mixed sample of at least five individual samples drawn over a period of time (maximum of 2 hours) with an interval of at least 2 minutes.

Quantity proportional sample. Equivalent to a flow proportional sample.

Random sample. Single sample taken from the wastewater flow.

Regulated Facilities. Those facilities for which criteria are established under this Chapter, such as DWTS, IWTS, or industrial discharges.

Septic system. On-site systems designed to safely dispose of sanitary waste and wastewater. A septic system primarily consists of a holding tank where natural bacterial action decomposes waste products into environmentally acceptable components - the major end-components being water, mixed with some other components that are not readily consumed by the bacterial action, gases, and undigested solids. The end products, except the undigested solids, are then discharged to the on-site environment.

Storm Water. Run-off and drainage from wet weather events such as rain, snow, ice, sleet or hail.

Substantial Modification. Any modification to a facility, the cost of which exceeds $1,000,000, regardless of funding source.

Time proportional sample. A sample taken with a definite volume over a given time period at definite time intervals.

Total Suspended Solids (TSS). The pollutant parameter total filterable suspended solids.

Total Toxic Organics (TTO). The summation of all quantifiable values greater than 0.01 mg/l for the toxic organics in Table C4.T1.

Waters of the Host Nation. Surface waters including the territorial seas recognized under customary international law, including:

- All waters, which are currently used, were used in the past, or may be susceptible to use in commerce.
- Waters which are or could be used for recreation or other purposes.
- Waters from which fish or shellfish are or could be taken and sold.
- Waters which are used or could be used for industrial purposes by industries.
- Waters including lakes, rivers, streams (including intermittent streams), sloughs, prairie potholes, or natural ponds.
- Tributaries of waters identified in this definition.

Note - domestic or industrial waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of this Chapter, are not waters of the host nation. This exclusion applies only to manmade bodies of water that were neither originally waters of the host nation nor resulted from impoundment of waters of the host nation.

C4.3 REQUIREMENTS

C4.3.1 EFFLUENT LIMITATIONS FOR DIRECT DISCHARGERS

C4.3.1.1 All direct discharges to waters of host nations will comply with the following effluent limitations. Compliance with any individual requirements given by the license for the wastewater treatment facility or by municipal drainage statutes is also required.

C4.3.1.1.1 Discharges from municipal wastewater treatment facilities shall meet the effluent limits in Table C4.T4 for COD, BOD_5, total nitrogen, NH_4-N, and total phosphorus.

C4.3.1.1.1.1 **Bayern**, **Rheinland-Pfalz**, and **Baden-Württemberg** have established additional effluent limit values for discharges into sensitive areas. These additional effluent limits are presented in Tables C4.T5 and C4.T6. Discharges from municipal wastewater treatment facilities into sensitive

areas in Bayern, Rheinland-Pfalz, and Baden-Württemberg shall meet these effluent limits.

C4.3.1.1.2 Domestic wastewater treatment facilities shall be in compliance with the requirements regarding the discharge of municipal wastewater (see Tables C4.T4 through C4.T6) by the dates presented in Table C4.T7. Municipalities are also obliged to install wastewater systems (based on their size) by the dates presented in Table C4.T7.

C4.3.1.1.3 Total Suspended Solids (TSS). TSS concentrations in effluent shall not exceed a limit value of 35 milligrams per liter (mg/l). Sampling shall be based on flow or time proportional 24-hour mixed samples. The requirements are met if not more than the defined number of samples (see Table C4.T37) exceeds the limit value.

C4.3.1.1.4 pH. Effluent pH will be maintained between 6.0 and 9.0. Compliance with pH requirements given by a license for the wastewater treatment facility or by municipal drainage statutes is also required.

C4.3.1.2 Monitoring requirements apply to all regulated facilities. The frequency of monitoring (both sampling and analysis) presented in Table C4.T2 addresses the parameters of BOD_5, TSS, and pH. Unless otherwise indicated, samples shall be collected at the point of discharge to the waters of the host nation.

C4.3.1.2.1 The following criteria present more frequent monitoring that is required in specific German states.

C4.3.1.2.1.1 **Baden-Württemberg**. Required wastewater monitoring frequencies in Baden-Württemberg are presented in Table C4.T8. For domestic wastewater treatment facilities equal to or greater than 5,000 citizen equivalents (EW) in size, 50% of the required random samples shall be collected alternately as flow proportional samples over a 24-hour period and the remaining 50% shall be collected as qualified random samples. Random samples shall be collected at differing times during the day. For wastewater facilities smaller than 5,000 EW in size, qualified random samples collected at different times during the day are considered sufficient.

C4.3.1.2.1.2 **Bayern**. Required wastewater monitoring frequencies in Bayern are presented in Table C4.T9. Given that the type of sample collection in Bayern is variable, the types are indicated with the frequencies presented in Table C4.T9. Samples shall be taken from the outflow of the treatment facility or from the inflow to the facility's clarification ponds *(Schönungsteiche)*.

C4.3.1.2.1.3 **Hessen**. Required wastewater monitoring frequencies in Hessen are presented in Table C4.T10. Wastewater samples shall be collected as 2-hour mixed samples or qualified random samples. For wastewater

treatment facilities of size category 2 and upwards (i.e., equal to or greater than 5,000 EW), 50% of the required samples shall be collected as 2-hour mixed samples and the associated flow measurements shall be included. For wastewater treatment facilities of size category 4 and above (i.e., equal to or greater than 10,000 EW) the samples shall be collected as flow proportional 24-hour mixed samples. To ensure representative sampling, all samples shall be collected on different weekdays and at different times during the day.

C4.3.1.2.1.4 **Rheinland-Pfalz**. Required wastewater monitoring frequencies in Rheinland-Pfalz are presented in Table C4.T11. Samples shall be collected day and time shifted if other requirements are not specified in the facility's operating license or permit. Any 24-hour mixed samples shall be collected flow and time proportional.

C4.3.1.3 Recordkeeping Requirements

C4.3.1.3.1 The following monitoring and recordkeeping requirements are BMPs and apply to all facilities. Retain records for 3 years.

C4.3.1.3.1.1 The effluent, concentration, or other measurement specified for each regulated parameter.

C4.3.1.3.1.2 The daily volume of effluent discharge from each point source.

C4.3.1.3.1.3 Test procedures for the analysis of pollutants.

C4.3.1.3.1.4 The date, exact place, and time of sampling and/or measurements.

C4.3.1.3.1.5 The person who performed the sampling and/or measurements.

C4.3.1.3.1.6 The date of analysis.

C4.3.1.3.2 Any additional recordkeeping requirements that are outlined in a permit or license that has been issued to a facility shall be complied with.

C4.3.1.3.3 The following criteria present additional recordkeeping actions that are required in specific German states.

C4.3.1.3.3.1 **Baden-Württemberg**

C4.3.1.3.3.1.1 The following criteria present requirements regarding the operating logbook.

- The logbook shall record the results of any operator-performed controls.
- The logbook shall be maintained and signed by the operator for wastewater treatment facilities, or the controller for other wastewater facilities.

- Logbook entries shall be signed on a monthly basis by the water protection officer or, if no other individual has been designated, by the operating manager *(Mitglied der Geschäftsleitung oder einem leitenden Angestellten).*
- Entries in the logbook shall be kept for at least 3 years.
- Entries in the logbook relating to inspections of wastewater lines and/or pipes shall be kept for a minimum for 10 years or until the next inspection, whichever is longer.

C4.3.1.3.3.1.2 Regarding wastewater treatment facilities with a biological-processing phase, the following recordkeeping requirements are applicable.

C4.3.1.3.3.1.2.1 The operating logbook shall be maintained for facilities greater than 100 EW in size in accordance to a template designed and approved by the water authority. For wastewater treatment facilities less than 100 EW in size, documentation comprised of drawings and notes or simple lists is considered sufficient.

C4.3.1.3.3.1.2.2 The operating logbook can be maintained as a loose-leaf binder or as print-out-lists when using automatic data processing (ADP) systems. When using an ADP system as the basis for the operating logbook, the recorded control data shall be archived on the day the data are recorded.

C4.3.1.3.3.1.2.3 The following data shall be registered in the operating logbook.

- The daily range of variation of the wastewater flow, pH, and all other regulated parameters that are measured at the outflow.
- The date and time of sludge and other residual substance removal from the clarification basin, the quantity of removed substances, and an explanation regarding any further treatment.
- The operating times of any sludge dehydration units and/or sludge drying facilities.
- Quantities of chemicals consumed on a weekly basis in the treatment process.
- The date and time of the installation of any monitoring equipment including data about the results of any replacements and/or repairs.

- Regarding any special occurrences: the type, time, duration, the name of the individual who reported the occurrence, and a description of actions taken.
- The date and time of any cleaning and/or service work conducted at locations that are important to the operation of the wastewater treatment facility.
- The date of any monitoring activities conducted by water authorities or technical experts.
- The date and time of any monitoring of the receiving water body and any observed conditions or impacts.
- The date, time, and amount of the addition of any nutritive substances.

C4.3.1.3.3.1.2.4 For municipal wastewater treatment facilities with a capacity greater than 5000 EW in size, the logbook shall also contain entries on the efficiency of the facility regarding the removal of BOD_5, COD, NH_4-N, NO_3-N, and phosphorus (in the case of phosphorus elimination treatment).

C4.3.1.3.3.2 **Bayern**

C4.3.1.3.3.2.1 The following data shall be recorded in the operating logbook.

- The name of the responsible technical manager.
- The name of responsible staff members.
- Results of any measurements and analysis related to operator performed controls.
- Descriptions of any special occurrences that show negative impacts to the facility or the receiving water body.
- The name of the water protection officer.
- A description documenting the general operation of, and any service work associated with, the collecting systems, storm water facilities, pump stations, and similar.

C4.3.1.3.3.2.2 The following are additional recordkeeping requirements for domestic wastewater facilities with a biological-processing phase. Regarding measurements related to the outflow, the following information shall be documented.

- Qualifications and responsibilities of staff performing the measurements.
- The installation of any monitoring equipment and any observed damage, malfunctions, service work, and procedural checks related to such equipment.

C4.3.1.3.3.3 **Hessen**

C4.3.1.3.3.3.1 An operating logbook shall be maintained for all wastewater treatment facilities. The logbook shall contain the following.

- The results of any operator-performed controls.
- The time of the measurements and controls.
- The methods of inspection and control.
- Any special occurrences that could impact the treatment or discharge in a negative way.

C4.3.1.3.3.3.2 Entries in the logbook shall be signed by the responsible individual at the facility.

C4.3.1.3.3.3.3 The logbook shall be maintained regularly by the water protection officer. If no water protection officer is designated, the individual managing wastewater treatment operations is responsible for maintaining the logbook.

C4.3.1.3.3.3.4 The logbook shall be submitted to the water authority upon request.

C4.3.1.3.3.3.5 The logbook shall be kept for at least 3 years.

C4.3.1.3.3.4 **Rheinland-Pfalz**

C4.3.1.3.3.4.1 In Rheinland-Pfalz, an operating logbook shall be maintained for wastewater treatment facilities. The logbook shall contain the following.

- The results of any operator performed controls.
- Measurement methods.
- Results of special condition surveys. For sewer lines this includes a visual survey to check the condition of the lines. This shall be performed at least once every 10 years. For mixed water treatment facilities and pump stations this requires a visual survey of structural conditions and functionality checks. These surveys must be performed at least monthly, and also on demand. Deficiencies and/or any sediment build up that may impact the function of the system must be corrected immediately.
- Operational malfunctions.

C4.3.1.3.3.4.2 The entries in the logbook shall be signed by the individual responsible for managing wastewater treatment facility operations.

C4.3.1.3.3.4.3 The entries shall also be verified and signed by the supervisor of the individual responsible for managing wastewater treatment facility operations.

C4.3.1.3.3.4.4 The logbook shall be maintained for a minimum of 5 years. Documentation of the special condition surveys shall be kept until the next surveys are performed.

C4.3.1.4 A system for investigating water pollution complaints from individuals or host nation water pollution control authorities will be established, involving the Environmental Executive Agent, as appropriate.

C4.3.2 EFFLUENT LIMITATIONS FOR NON-CATEGORICAL INDUSTRIAL INDIRECT DISCHARGERS

C.4.3.2.1 Effluent Limits

C4.3.2.1.1 The requirements contained in any municipal drainage statute and any discharge license issued by the water authority shall be complied with.

C4.3.2.1.2 The following general requirements regarding indirect discharges shall be met.

- Staff working at the municipal wastewater treatment facility may not be exposed to a health risk resulting from the indirect discharge.
- The canalization system, wastewater treatment facility infrastructure, and any other additional equipment may not be damaged by the indirect discharge.
- Operation of the wastewater treatment facility and the sludge treatment facility may not be interfered with or compromised in any manner by the indirect discharge.
- Discharge from wastewater treatment facilities cannot damage the environment or the receiving water body in such a manner that it no longer meets the requirements of other public directives.
- The wastewater sludge shall be disposed of in an environmentally acceptable manner.

C4.3.2.1.3 The discharge is prohibited if:

- The operator can not completely fulfill his/her obligations.
- Negative environmental impacts (i.e., odors) could be emitted from the facility.
- Sludge treatment and disposal would become significantly more difficult with regard to the receiving DWTS.

C4.3.2.1.4 The following effluent limits and requirements will apply to all discharges of pollutants to DWTSs and associated collection systems from process wastewater for which specific standards have not been established.

C4.3.2.1.4.1 Solid or Viscous Pollutants

C4.3.2.1.4.1.1 The discharge of solid or viscous pollutants that would result in an obstruction to the domestic wastewater treatment facility flow is prohibited.

C4.3.2.1.4.1.2 It is specifically prohibited to discharge solid components or waste substances (to include in a cut or reduced condition). Examples of such solid components or waste substances include dust-heaps, rubbish, rubble, glass, sludge, ashes, kitchen waste, fibers, husks, waste from brewing and wine-making, solid substances containing organic mud, yeast containing residues, whey, latices, leather rests, bristles, silage leakage, and waste from butcheries or animal corpse utilization.

C4.3.2.1.4.1.3 It is specifically prohibited to discharge hardening substances, such as cement, lime, milk of lime, gypsum, mortar, potato starch, synthetic resin, bitumen, tar.

C4.3.2.1.4.2 Ignitability and Explosivity

C4.3.2.1.4.2.1 The discharge of wastewater with a closed cup flashpoint of less than 60°C (140°F) is prohibited.

C4.3.2.1.4.2.2 The discharge of wastes with any of the following characteristics is prohibited.

C4.3.2.1.4.2.2.1 A liquid solution which contains more than 24% alcohol by volume and has a flash point less than 60°C (140°F).

C4.3.2.1.4.2.2.2 A non-liquid which under standard temperature and pressure can cause a fire through friction.

C4.3.2.1.4.2.2.3 An ignitable compressed gas.

C4.3.2.1.4.2.2.4 An oxidizer, such as peroxide.

C4.3.2.1.4.2.2.5 The discharge of flammable and ignitable substances such as petrol, benzene, and oil is prohibited.

C4.3.2.1.4.3 Reactivity and Fume Toxicity. The discharge of any of the following wastes is prohibited.

C4.3.2.1.4.3.1 Wastes which are normally unstable and readily undergo violent changes without detonating.

C4.3.2.1.4.3.2 Wastes which react violently with water.

C4.3.2.1.4.3.3 Wastes which form explosive mixtures with water or form toxic gases or fumes when mixed with water.

C4.3.2.1.4.3.4 Cyanide or sulfide waste that can generate potentially harmful toxic fumes, gases, or vapors.

C4.3.2.1.4.3.5 Waste capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

C4.3.2.1.4.3.6 Wastes which contain explosives regulated by Chapter 5, Hazardous Material.

C4.3.2.1.4.3.7 Wastes which produce any toxic fumes, vapors, or gases with the potential to cause safety problems or harm to workers.

C4.3.2.1.5 Corrosivity

C4.3.2.1.5.1 It is prohibited to discharge pollutants that have the potential to be structurally corrosive to the DWTS. The pH-value of discharged wastewater shall be between 6.5 and 10.0.

C4.3.2.1.5.2 The discentration of sulfate may not exceed 600 milligrams per liter (mg/l). On an individual basis higher values may be permitted to be discharged depending on system construction materials, dilution, and other system specific conditions.

C4.3.2.1.6 Oil and Grease

C4.3.2.1.6.1 The discharge of the following oils, which can pass through or cause interference to the DWTS, is prohibited: petroleum oil, non-biodegradable cutting oil, and products of mineral oil origin.

C4.3.2.1.6.2 The discharge of wastewater containing oil and grease or contaminated with oil and grease containing substances is prohibited.

C4.3.2.1.6.3 The concentration of non-volatile lipophilic substances shall not exceed 250 mg/l total (DIN 38409 part 17) or 100 mg/l individual (DIN38409 part 19).

C4.3.2.1.7 Spills and Batch Discharges (slugs). Activities or installations that have a significant potential for spills or batch discharges will develop a slug prevention plan. Each plan shall contain the following minimum requirements:

C4.3.2.1.7.1 Description of discharge practices, including non-routine batch discharges;

C4.3.2.1.7.2 Description of stored chemicals;

C4.3.2.1.7.3 Plan for immediately notifying the DWTS of slug discharges and discharges that would violate prohibitions under this section, including procedures for subsequent written notification within five days;

C4.3.2.1.7.4 Necessary practices to prevent accidental spills. This would include proper inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of facility site runoff, and worker training;

C4.3.2.1.7.5 Proper procedures for building containment structures or equipment;

C4.3.2.1.7.6 Necessary measures to control toxic organic pollutants and solvents; and

C4.3.2.1.7.7 Proper procedures and equipment for emergency response, and any subsequent plans necessary to limit damage suffered by the treatment facility or the environment.

C4.3.2.1.8 Trucked and Hauled Waste. The discharge of trucked and hauled waste into the DWTS, except at locations specified by the DWTS operator, is prohibited.

C4.3.2.1.9 Temperature. Wastewater with a temperature greater than 35^{o}C is not permitted to be discharged into a DWTS.

C4.3.2.1.10 Radioactive Substances. The discharge of radioactive substances is prohibited.

C4.3.2.1.11 Other Substances. In addition to the prohibitions contained in C4.3.2.1.1 to C4.3.2.1.9, the following are prohibited to be discharged to a DWTS:

- infectious substances and medications;
- dyes that result in a visible staining of the wastewater in the wastewater treatment facility or in the receiving water body;
- solvents;
- sludge or other removed substances *(Räumgut)* from light substance separators or grease separators, dung water, liquid manure, wastewater from dung pits and animal farming, silage ferments, blood from butcheries, and whey;
- settled substances *(Absetzgut)*, sludge or suspensions from pretreatment facilities, removed substances from other individual wastewater treatment facilities and/or toilet pits, independent of municipal regulations about the disposal of wastewater sludge;
- substances and groups of substances that are considered dangerous in relation to their poisoning effect, longevity, accumulation ability, or carginogenic and teratogenic effects such as heavy metals, cyanides, halogenated hydrocarbons, polycyclic aromatic hydrocarbons, and phenols; and
- cleaning and disinfecting agents and/or washing agents that lead to unreasonable foaming.

C4.3.2.1.12 Effluent limit values for specific indirect discharge parameters are presented in Table C4.T12.

C4.3.2.2 Complaint System. A system for investigating water pollution complaints from host nation water pollution control authorities will be established involving the Environmental Executive Agent as appropriate.

C4.3.3 EFFLUENT LIMITATIONS FOR CATEGORICAL INDUSTRIAL DISCHARGERS (DIRECT OR INDIRECT)

C4.3.3.1 General discharge requirements. The wastewater pollution load of industrial discharges shall be minimized to the maximum extent possible through the application of the following measures, as appropriate to the particular industrial discharge.

- Treatment of process baths by means of appropriate procedures such as membrane filtration, ion exchange, electrolysis, or thermal procedures in order to achieve the maximum standing time of the process baths.
- Retention of bath components with procedures such as low-spreading transportation of goods *(verschleppungsarmer Warentransport)*, spatter protection, or optimized bath composition.
- Multiple use of rinse water through implementation of procedures such as cascade rinsing or circulatory rinsing through an ion exchange system.
- Recovery and return of appropriate bath components from rinsing baths back to the process baths.
- Recovery of EDTA from chemical copper baths and associated rinsing baths.

C4.3.3.2 Regarding the requirements for industrial wastewaters at the point of discharge:

- Requirements for hydrocarbons relate to the collection of a random sample.
- Regarding electroplating of glass, the requirement for fish toxicity applies only with the dilution factor G_F=2.

C4.3.3.3 Requirements for industrial wastewater prior to mixing with other water:

C4.3.3.3.1 The requirements for AOX, free chlorine, as well as the requirements for batch discharge facilities relate to the values associated with the collection of a random sample. For chemical reductive nickel, a separation value of 1 mg/l applies.

C4.3.3.3.2 Regarding electroplating of glass, the requirements for copper and nickel apply.

C4.3.3.3.3 The AOX requirements for Industrial Branch “Electroplating of Common and Precious Metals” are considered to be complied with, if:

- during processing/production, all applied hydraulic oils, greasing agents, and water displacement agents do not contain halogenated compounds;
- hydrochloric acid which has been introduced during production and/or for wastewater treatment, does not show contamination with organic

halogenated compounds and chlorine above levels established by DIN 19610 (November 1975);

- iron and aluminum salts which have been introduced for wastewater treatment do not indicate contamination with organic halogenated compounds greater than 100 milligrams per kilogram (mg/kg) iron and aluminum within the applied treatment agents;
- after approval, on a case by case basis, given the following:
  - cyanide containing baths are substituted by cyanide free baths;
  - cyanide containing compounds are decontaminated without introduction of sodium hypochlorite; and
  - only cooling lubricants are applied, that do not contain organic halogenated compounds.

C4.3.3.3.4 The requirements for production specific limit values listed for cadmium are associated with the introduced amount of cadmium. These requirements are met, if the requirements listed in items C4.3.3.2 and C4.3.3.4 are met, and if the respective concentration values for cadmium are not exceeded.

C4.3.3.4 The following criteria contain requirements for industrial wastewater at the point of origin. The "point of origin" of the wastewater is defined as the outflow of pretreatment facilities for the specific parameter.

C4.3.3.4.1 Wastewater may contain only halogenated solvents that are allowed to be used. These requirements are met, if it can be proved that only permitted halogenated solvents are introduced. The value for LHKW (easily volatile halogenated hydrocarbons) may not exceed 0.1 mg/l per random sample collected from the effluent of the wastewater pretreatment facility (LHKW is the sum of Trichlorethene, Tetrachlorethene, 1,1,1-Tichlorethene, and Dichloromethylene calculated as chlorine).

C4.3.3.4.2 Mercury containing wastewater may not exceed a value of 0.05 mg/l per qualified random sample or 2-hour-mixed sample.

C4.3.3.4.3 Wastewater from degreasing baths, demetalization baths, and nickel baths may not contain EDTA.

C4.3.3.4.4 Wastewater from cadmium containing baths (including rinsing baths) may not exceed a value of 0.2 mg/l per qualified random sample or 2-hour-mixed sample.

C4.3.3.5 Individual requirements given by a discharge license or permit issued by a competent German water authority shall be complied with.

C4.3.3.6 Electroplating of Common Metals. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T13 shall be met.

C4.3.3.7 Electroplating of Precious Metals. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T14 shall be met.

C4.3.3.8 Anodizing. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T15 shall be met.

C4.3.3.9 Metal Coatings. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T16 shall be met.

C4.3.3.10 Chemical Etching and Milling. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T17 shall be met.

C4.3.3.11 Electroless Plating. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T18 shall be met.

C4.3.3.12 Printed Circuit Board Manufacturing. In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the requirements presented in Table C4.T19 shall be met.

C4.3.3.13 In the absence of individual requirements given by a discharge license or permit issued by a competent German water authority, the following requirements shall be met.

- **Baden-Württemberg.** See Table C4.T20 for monitoring requirements for effluent parameters of other wastewater facilities.
- **Bayern.** See Table C4.T21 for applicable monitoring requirements for effluent parameters of other wastewater facilities.
- **Hessen.** See Table C4.T22 for applicable monitoring requirements for effluent parameters of other wastewater facilities.
- **Rheinland-Pfalz.** See Table C4.T23 for applicable monitoring requirements for effluent parameters of other wastewater facilities.

C4.3.4 STORM WATER MANAGEMENT

C4.3.4.1 Develop and implement storm water pollution prevention (SWPP) plans for activities listed in Table C4.T3. Update the SWPP plans annually.

C4.3.4.2 Employee Training. Personnel who handle hazardous substances or perform activities that could contribute pollution to wet weather events should be trained in appropriate Best Management Practices. Such training should stress SWPP principles and awareness of water protection zones (see Chapter 3, Drinking Water) and possible pollution sources including non-traditional sources such as sediment, nitrates, pesticides, and fertilizers.

C4.3.4.3 If a facility is licensed in accordance with a German federal or state requirement, any requirements that are associated with SWPP contained in the license are applicable and must also be considered in the development and implementation of a SWPP plan and during the conduct of employee training.

C4.3.5 SEPTIC SYSTEMS

The use of septic systems is prohibited.

C4.3.6 SLUDGE DISPOSAL

All sludges produced during the treatment of wastewater will be disposed of under Chapter 6, Hazardous Waste or Chapter 7, Solid Waste as appropriate.

C4.3.7 WATER PROTECTION OFFICER

C4.3.7.1 Facilities that discharge greater than 750 cubic meters per day (m^3/day)(0.2 million gallons per day [mgd]) of domestic or industrial wastewater into surface water shall designate one or more persons as responsible for water protection (i.e., Water Protection Officer). It should be noted that the water authority can require the designation of a water protection officer for indirect discharges and/or facilities that discharge less than 750 m^3/day of wastewater into surface waters under certain conditions.

C4.3.7.2 Duties of the Water Protection Officer are to:

- Ensure compliance with directives (i.e., permit or license), conditions, and obligations with regard to water protection, orderly operating and service of the facility, and conducting measurements of wastewater and recording the results. The water protection officer shall indicate any malfunctions and recommend corrective actions to eliminate the deficiency.
- Take actions regarding the implementation of suitable wastewater treatment measures and procedures to ensure the orderly utilization and removal of residual substances derived from wastewater treatment.
- Develop and introduce intra-facility procedures for avoiding or reducing the accumulation of different types and amounts of wastewater while working toward ecologically beneficial production.
- Explain to the facility staff the function of each piece of equipment and the facility's treatment processes. Ensure such staff are aware of the impact of, and the required actions that shall be taken in the case of a malfunction.
- Report on an annual basis to the organizations or facilities that contribute wastewater about applied and planned measures.

C4.3.8 ADDITIONAL INDUSTRIAL DISCHARGE REQUIREMENTS

C4.3.8.1 The following criteria apply to discharges of wastewater from drinking and bathing water and industrial water processing, and from circulation cooling systems from factories and industrial processes.

C4.3.8.1.1 Wastewater from drinking and bathing water and industrial water processing and circulation cooling systems from factories and industrial processes may not contain compounds that form organic complexes (except phosphonates and polycarboxylates) that are not easily degradable.

C4.3.8.1.2 Chrome compounds, mercury compounds, nitrite, metal organic compounds, and mercaptobenzthiazole which result from the introduction of operating and auxiliary agents are not permitted as constituents of the wastewater resulting from drinking and bathing water and industrial water processing and circulation cooling systems from factories and industrial processes.

C4.3.8.1.3 The discharge limits presented in Table C4.T24 apply to wastewater discharged from drinking water processing facilities.

C4.3.8.1.4 The discharge limits presented in the Table C4.T25 apply to wastewater discharged from fresh water cooling systems after pulse treatment (*Stoßbehandlung*) with microbial agents. Other treatment agents, except hydrogen peroxide (H_2O_2) or ozone (O_3) are prohibited in the wastewater.

C4.3.8.1.5 The discharge limits presented in Table C4.T26 apply to wastewater discharged from the outflow of circulation cooling systems of power facility cooling systems. Zinc compounds from cooling water-conditioning agents are prohibited in the wastewater.

C4.3.8.1.6 The discharge limits presented in Table C4.T27 apply to wastewater discharged from any other cooling system.

C4.3.8.1.7 The discharge limits presented in Table C4.T28 apply to wastewater discharged from steam production at any other facilities. For stacked basins (*Stapelbecken*), all values apply to the random sample.

C4.3.8.1.8 The limits for chemical oxygen demand (COD) that are presented in Tables C4.T24 through C4.T28 can be measured by monitoring for total organic carbon (TOC). In this case, the TOC limit value is three times the COD limit value.

C4.3.8.2 The following requirements apply to discharges of wastewater from battery production, mechanical workshops, gliding grinding works, and paint shops associated with metal works and metal processing.

C4.3.8.2.1 For wastewater discharges, the discharge limits presented in Table C4.T29 apply at the point of discharge from the referenced operations.

C4.3.8.2.2 For wastewater discharges, the discharge limits Table C4.T30 apply before mixing with other waters from these referenced operations.

C4.3.8.3 The following requirements apply to discharges of mineral oil contaminated wastewater from facilities for the repair, maintenance, and cleaning and preservation of vehicles. The requirements do not apply to the discharge of wastewater from ships, the discharge of wastewater from metal working and paint shops, and the discharge of wastewater from cleaning of containers used to transport mineral oils

C4.3.8.3.1 Wastewater shall not contain organically bound halogenated compounds from washing and cleaning agents or other auxiliary substances.

C4.3.8.3.2 Wastewater, with the exception of wastewater from automated vehicle washing facilities, provided that the volume of wastewater containing petroleum exceeds 1 m^3 per day, shall not exceed 20 mg/l total hydrocarbons in a random sample. This applies only to discharges from pretreatment facilities where total hydrocarbons are used as the indicating parameter for dangerous substances.

C4.3.8.3.3 The limit value that is established for total hydrocarbons is considered to be complied with, if:

C4.3.8.3.3.1 A separator consisting of a separator for low-density liquids according to DIN 1999 (design standard for POL-separator) with an additional coalescence separator is built into the discharge pipe before mixing with other wastewater, or an equivalent treatment facility is operated.

C4.3.8.3.3.2 Only wastewater containing washing and cleaning agents or unstable emulsions that do not impair the cleaning capacity of the separator or equivalent treatment facility is introduced into the facility.

C4.3.8.3.3.3 The separator meeting DIN 1999 standards with an additional coalescence separator is built in such a way that when using a heated oil-water mixture in accordance with the testing requirements in DIN 1999 Part 3, a residual concentration of 5mg/l of heating oil is not exceeded in the discharge pipe.

C4.3.8.3.3.4 A maintenance contract with a qualified business shall exist for maintaining the separator or equivalent treatment facility.

C4.3.8.3.3.5 The separator or equivalent treatment facility is inspected for proper operating condition according to the state law at intervals of no more than 5 years.

C4.3.8.3.3.6 The design of the separator according to DIN 1999 with an additional coalescence separator was based on a wastewater volume of 4 liters per second (l/sec) in dry weather, and that design volume is not exceeded.

C4.3.8.4 The following requirements apply to wastewater discharges from the above ground deposit of waste (e.g., landfill operations).

C4.3.8.4.1 The volume and the pollution load of seepage water shall be kept at a minimum according to the state of the art technologies or through suitable measures related to the construction and operation of the waste disposal area.

C4.3.8.4.2 For wastewater discharges at the point of discharge from an area of above ground deposit of waste, the discharge limits presented in Table C4.T31 apply.

C4.3.8.4.2.1 For wastewater that contains greater than 4,000 mg/l of COD prior to treatment (contrary to the above concentration) a discharge value from a 2-hour mixed sample or qualified random sample that corresponds to 95% reduction related to the inflow pollution load compared to the outflow pollution load over 24 hours is required. The inflow pollution load is based on the capacity of the facility as contained in the discharge permit.

C4.3.8.4.2.2 The requirement for total hydrocarbons relates to the collection of a random sample. This requirement does not apply to wastewater from the deposit of community wastes (*Siedlungsabfälle*).

C4.3.8.4.2.3 The requirement for total nitrogen applies to a wastewater temperature of $12^{o}C$ or greater at the outflow of the biological reactor. A limit value for total nitrogen is also considered to be complied with if the requirement related to total bound nitrogen (TN_b), is met.

C4.3.8.4.3 For wastewater discharges from an area of above ground deposit of waste before mixing with other waters, the discharge limits Table C4.T32 apply.

C4.3.8.4.4 Wastewater may only be mixed with wastewater of another origin in a joint biological-final treatment facility if at least one of the following prerequisites are expected to be met:

C4.3.8.4. 4.1 For fish, photogenic bacteria, or daphnia, the toxicity of a representative wastewater sample may not exceed the following limits after performing an elimination test supported by a continuous flow reactor biological laboratory *Durchlauf*-wastewater treatment facility (i.e. according to DIN 38412L26):

Fish Toxicity (G_F)	2
Daphnia Toxicity (G_D)	4
Photogenic Bacteria Toxicity (G_L)	4

Through measures such as nitrification in the biological laboratory wastewater treatment facility, pH maintenance shall be ensured, so that no exceedance of the G_F-value is caused by ammonia (NH_3). Wastewater may be diluted for starting the laboratory wastewater treatment facility. In the case of nutrition shortness, nutritive substances may be added. During a testing phase no dilution water can be added.

C4.3.8.4.4.2 A COD reduction of 75% shall be achieved.

C4.3.8.4.4.3 The wastewater shall show a COD concentration of less than 400 mg/l before mixing with other waters and undergoing common biological treatment.

C4.3.8.5 The following requirements apply to wastewater resulting from the dry cleaning of textiles and rugs as well as from the dry cleaning of goods made of fur and leather when using solvents with halogenated hydrocarbons.

C4.3.8.5.1 To the extent that more than one cleaning machine is operated in the same dry-cleaning facility, the sum of the capacities of the individual machines shall be used to determine the sampling requirements.

C4.3.8.5.2 For wastewater discharges from regulated dry cleaning facilities, the discharge limits presented in Table C4.T33 apply.

C4.3.8.5.3 The value established for AOX (absorbable organically bound halogens) is considered to be complied with if the content of halogenated hydrocarbons in wastewater, as determined through adding the individual substances used and calculating as chlorine, is less than the established AOX value.

C4.3.8.5.4 The value established for AOX is also considered to be complied with if a wastewater treatment facility for halogenated hydrocarbons processing is properly installed, operated, and maintained and is inspected (with respect to its proper condition) before startup operation and at regular intervals of no more than 5 years.

C4.3.8.5.5 Requirements for wastewater at the place of origin. Wastewater may contain only solvents that are allowed for dry-cleaning. This requirement is considered to be complied with if proof of the introduction of only allowable halogenated hydrocarbons can be provided.

C4.3.8.6 The following requirements apply to wastewater resulting from photographic procedures of silver-halide photography or from the treatment of liquid residues from these procedures. These requirements do not apply to indirect cooling systems of industrial water processing, to other photochemical processes, and to facilities with a film and paper throughput of less than 200 square meters per year (m^2/year), if no wastewater is produced from the treatment baths.

C4.3.8.6.1 General Requirements. The pollution load shall be kept at a minimum through the following measures:

C4.3.8.6.1.1 Separate collecting of fixing, developing, bleaching and bleach fixing baths as well as overflows during bath treatment.

C4.3.8.6.1.2 Reduction of solution spreading through suitable measures such as spray protection or low-spreading transportation of film and paper.

C4.3.8.6.1.3 Reduction of rinse water through suitable measures such as cascade rinsing, circulatory rinsing, and economical water control.

C4.3.8.6.1.4 Recovery and reuse of fixing baths, except from X-ray and microfilm photography, through a recycling process for facilities with a paper and film throughput of greater than 3,000 m²/year.

C4.3.8.6.1.5 Recovery of fixing baths, leach fixing baths, bleaching baths, and color developers through a recycling process, for facilities with a paper and film throughput of more than 30,000 m² per year.

C4.3.8.6.2 Wastewater from bleaching or bleach fixing baths may only contain compounds that form organic complexes that achieve a degradation rate of 80% within 28 days.

C4.3.8.6.3 It is prohibited to treat photographic development baths with chlorine or hypochlorite.

C4.3.8.6.4 Proof of compliance with these requirements can be provided by recording the use of all agents used in the photo development process in the operating logbook and by maintaining production data that demonstrates that materials used in the development process contain none of the prohibited constituents.

C4.3.8.6.5 The discharge limits presented in Table C4.T34 apply to wastewater discharges prior to mixing with other waters from photo treatment baths.

C4.3.8.6.6 The discharge limits presented in Table C4.T35 apply to wastewater discharges before mixing with other waters of rinse water from regulated facilities. The limits presented in Table C4.T35 for a film and paper throughput of 3,000 to 30,000 m²/year are considered to be complied with if a facility designed for the reduction of silver is properly installed, operated, and maintained, and is inspected (with respect to its proper condition) before startup operation and at regular intervals of no more than 5 years.

C4.3.9 OPERATOR CONTROL REQUIREMENTS IN BADEN-WÜRTTEMBERG

The criteria in this subsection apply to all municipal and other wastewater facilities as well as to the affected receiving surface water. The criteria do not apply to domestic wastewater treatment facilities with a discharge of less than 8,000 liters per day (l/day) and to light substance separators (*Leichtstoffabscheider*) designed to treat less than 10 liters per second (l/s). The responsible water authority can allow deviations from these criteria, if sufficient controls can be guaranteed through other means.

C4.3.9.1 Operator controls. Operators of regulated facilities shall perform measurements, analysis, and controls in accordance with the requirements. The facilities shall be equipped with necessary monitoring instruments. The operator control responsibilities can be delegated to third parties.

C4.3.9.2 Operating logbook. The operating logbook shall be maintained by the individual responsible for performing the controls. The results of the operator-performed controls shall be recorded. The entries shall be reviewed and signed on a monthly basis by the water protection officer or, if no one is designated, by the operating manager (*Mitglied der Geschäftsleitung oder einem leitenden Angestellten*). If requested, the entire logbook or specific information shall be submitted to the host nation water authority. The operating logbook shall be maintained for at least 3 years. Entries related to the inspection of wastewater lines and pipes shall be maintained until the next inspection, or at a minimum for 10 years.

C4.3.9.3 Sample collection and analysis procedures. Sample collection, the time period for sample collection, measurements, and analysis shall be conducted in accordance with approved procedures.

C4.3.9.4 Seepage Control. Wastewater lines and pipes shall be investigated on a regular basis, but at least every 10 years. For facilities where seepage controls could be approved according to the general agreed technical rules, an inspection routine of 15 years is sufficient.

C4.3.9.5 Hold Samples. For wastewater treatment facilities, hold samples shall be collected on a daily basis at the effluent and maintained for at least 10 days.

C4.3.9.6 Operation Malfunctions and Obligation for Notification. Operation malfunctions and other events that may result in a reduced efficiency of the treatment facility or negatively affect the receiving water body, shall be identified immediately to the individual who maintains the operating logbook, to the operator of the facility, and to the lower water authority. These events and malfunctions shall also be recorded in the operating logbook.

C4.3.9.7 Existing Facilities. Existing facilities shall be upgraded with sufficient equipment for performing any required operator controls.

C4.3.9.8 Operator Controls for Wastewater Facilities with a Biological Processing Phase

C4.3.9.8.1 These requirements apply to municipal and non-municipal wastewater treatment facilities that have a biological treatment phase. The biological treatment phase may or may not be combined with a chemical and/or mechanical treatment phase. Capacities are indicated in EW based on BOD_5 raw pollution loads in untreated wastewater.

C4.3.9.8.2 Wastewater treatment facilities equal to or larger than 5,000 EW in size shall take 50% of the required wastewater samples as flow proportional samples over a 24-hour period and 50% as qualified random samples. The sample types shall be taken alternately. Random samples shall be taken at differing times each day so that, over time, they sample the condition of the facility over all its operating hours. For wastewater treatment facilities equal to or smaller than 5,000 EW in size time shift, qualified random samples are sufficient.

C4.3.9.8.3 If the control and measurement methods prescribed herein are deviated from using other suitable methods that are not contrary to the permit issued for the facility, the operator shall at least once a year perform the four control and measurement methods.

C4.3.9.8.4 Discharge points into surface waters shall be examined visually for items such as sedimentation, washes, odor, color, etc. In addition, samples shall be collected upstream and downstream of the discharge, after extensive mixing of the water is assured, and analyzed.

C4.3.9.8.5 The frequency for operator control and analysis that is specified in Table C4.T38 shall be followed.

C4.3.9.8.6 Facilities with a capacity of 5,000 EW or greater shall take flow proportional samples over 24 hours and store them in a dark place at a temperature of less than 5^{o}C. The samples shall be marked with the name of the facility, person collecting the sample, discharge point, date, and time.

C4.3.9.8.7 Measuring and Analysis Methods

C4.3.9.8.7.1 Wastewater flow measurements for facilities from 100 EW to less than 1,000 EW may be conducted using a weir flowmeter (fixed installation or pin plug).

C4.3.9.8.7.2 Facilities with a capacity of 1,000 EW and greater, shall use a self-recording measuring instrument with counter, measuring in accordance with the methodology given in DIN 19559 (July 1983), or an equivalent method. The measuring instrument and the flow recorder shall be checked and adjusted at regular intervals, but not less than once every 3 months. The flow recorder shall operate continuously, even if there is an operating break. Dated data strips shall be generated at least once per week. Data shall be kept for a minimum of 3 years.

C4.3.9.8.7.3 Any required measuring points shall be installed so that only the treated wastewater is collected for a sample with no side stream influence.

C4.3.9.8.7.4 Determination of individual parameters, unless otherwise required by a license or permit, shall be conducted as follows.

- For BOD_5 in wastewater treatment facilities smaller than 50,000 EW in capacity, the respirometrical method shall be used. For facilities greater than 50,000 EW in capacity the dilution method shall be used. Effluent measures for all facilities shall be conducted with the addition of ATH.
- For COD, NH_4-N, NO_3-N, PO_4-P, P_{total} the photometrical method with rapid analysis shall be used. If required after an oxidizing digestion, NH_4-N in facilities with a capacity of less than 1,000 EW may be determined with test stripes in a non-sedimented, homogenized sample.

- Oxygen content of wastewater treatment facilities with a capacity of less than 1,000 EW may be determined using tablets. For treatment facilities with a capacity of 1,000 EW or greater, a measuring instrument shall be used.
- The pH value of wastewater treatment facilities of a capacity of less than 1,000 EW may be determined using pH-paper. For treatment facilities with a capacity of 1,000 EW or greater, a measuring instrument shall be used. For continuous monitoring by a fixed, self-recording measuring instrument, the instrument shall be checked and adjusted at regular intervals but at least every 3 months. The pH electrode has to be cleaned daily. The measuring instrument shall be operated continuously, even if the facility is not. Write stripes shall be marked weekly at least once with the date. Data shall be maintained for a minimum of 3 years.
- Temperature shall be determined using a measuring instrument. For continuous measurements by a fixed, self-recording instrument, the instrument shall be checked and adjusted at regular intervals, but at least every 3 months. It shall be in continuous operation, even if there is an operating break at the facility. Write stripes shall be marked weekly at least once with the date. Data shall be maintained for a minimum of 3 years.
- In general, inflow controls and monitoring equipment shall be installed ahead of the inflow to the biological stage. If there is pretreatment, operators shall take precautions to see that the sampling instrument can also be used before the pretreatment basin for periodic comparative measurements.
- In general, outflow controls shall be installed after the treatment basin; for pond facilities, they shall be installed behind the final ponds.

C4.3.9.8.8 Wastewater treatment facility operators shall analyze and control contaminants and additions that could possibly influence the water and the efficiency of any treatment facilities. For this purpose, the operator shall establish an indirect discharger register, where wastewater volume, type, and amount of introduced substances that may have an imminent effect on the municipal wastewater treatment facility, shall be recorded. These requirements apply to industrial dischargers that:

- discharge wastewater contaminated with regulated hazardous substances;
- pay a strong pollution extra charge according to a drainage statute; or
- operate a wastewater pretreatment facility that is licensed by the water law.

C4.3.9.8.8.1 The dischargers shall be identified on a map that also shows the municipal wastewater system. The recorded data and maps shall be

kept together with the operating logbook and be submitted on demand to the water authority. These documents form the indirect discharge register. The indirect discharge register shall be reviewed on an annual basis.

C4.3.9.8.9 An operating logbook shall be maintained.

C4.3.9.9 Operator Controls in Other Wastewater Treatment Facilities

C4.3.9.9.1 Applicability. These requirements apply to wastewater treatment facilities that perform splitting of emulsions; detoxification of wastewater, that contains cyanide, nitrite, or chromium; neutralization of alkaline or acidic wastewater and so connected with a separation of heavy metals; precipitation or flock formation of wastewater substances by addition of chemicals; gravity separation and settling or other separation of wastewater substances; ion exchange, filtration, ultra-filtration or flotation of wastewater; mixing, buffering, and balancing of wastewater; other physical or chemical treatment of wastewater and combinations of such kinds of systems and methods including sludge dehydration and the associated wastewater disposal.

C4.3.9.9.2 The outflow operator controls relate to the quality and quantity of treated wastewater at the point of discharge into municipal wastewater facilities (indirect discharge) or into surface waters (direct discharge). The controls can also relate to partial flows of wastewater.

C4.3.9.9.3 Wastewater treatment facilities of greater than 50 m^3 (direct introduction) or greater than 500 m^3 (indirect introduction) shall collect 50% of the required wastewater samples for the chemical examinations as quantity-proportional over 24 hours and 50% as qualified random samples. The type of sampling shall alternate. Random samples shall be taken at varying times (time-shifted). Wastewater treatment facilities up to 50 m^3 (direct introduction) or 500 m^3 (indirect introduction) in size may use time-shifted qualified random samples only.

C4.3.9.9.4 The operator may deviate from the specified control measures in this section and use other suitable analysis methods, such as rapid analysis methods or field methods, unless restricted by permit. If other methods are used, the operator shall analyze a sample in accordance with these requirements at least once per year.

C4.3.9.9.5 Operators shall visually inspect the area around the direct discharge point(s) for problems such as sedimentation, washes, odor, color, etc. Samples shall be taken above and below the introduction place after extensive mixing of the wastewater with the natural waters.

C4.3.9.9.6 Wastewater treatment facility operators are required to determine the type of contaminants in their wastewater stream. In addition to the measures that are prescribed in Tables C4.T39 and C4.T40, the operator shall sample the

wastewater from production facilities that are known to use substances harmful to water to determine the type, quantity, and content of the discharge. This is not necessary if the substance in question has a consumption rate of less than 10 kg per year. The results of these examinations are to be recorded and updated at least annually.

C4.3.9.9.7 The hold samples are to be taken quantity-proportional over 24 hours (mixed sample) from the outflow of the treatment facility. If the facility is a charge-operating facility, a quantity-proportional combined/collected mixed-sample (of the samples of the individual charges) is sufficient. The hold samples shall be marked with the name of the facility, the individual collecting the sample, the collection point, date, and time. Samples shall be stored in the dark at a temperature less than 5°C.

C4.3.9.9.8 Measurement and Analysis.

C4.3.9.9.8.1 Flow Measurement.

For direct introduction, the wastewater flow (without cooling water and domestic wastewater) shall be measured by a self-recording measuring instrument with counter, in accordance with the methodology given in DIN 19 559 (July 1983), or an equivalent method. The measuring instrument and the flow recorder shall be checked and adjusted at regular intervals, but at least every 3 months. The flow recorder is to be used permanently, even if there is an operating break. Write stripes shall be provided at least once per week with the date.

For indirect introduction into a public canal system, where the wastewater quantity of the wastewater treatment facility is less than 500 m^3/day, measurements may be made using a water meter on the fresh-water side. For wastewater treatment facilities with a wastewater quantity greater than 500 m^3/day, the wastewater flow shall be measured in accordance with the direct introduction requirements.

Industrial wastewater shall be measured independent of cooling water and domestic wastewater. If the facility is a charge-operating facility, the measurement procedure shall be coordinated with the water authority.

Data shall be maintained for 3 years.

Any required measuring points in a wastewater treatment facility shall be installed so that only the treated wastewater is sampled without side streams.

C4.3.9.9.8.2 Determination of Individual Parameters.

If there are no other requirements contained in the permit, operators shall perform the following operator controls:

- BOD_5 in facilities with a capacity of less than 500 m^3/day may be determined by dilution method. Effluent measures for all facilities shall be conducted with the addition of ATH.
- COD, NH_4-N, NO_3-N, PO_4-P, P_{total} shall be determined photometrically with the rapid analysis method. If required after an oxidizing digestion, NH_4-N in facilities with a flow of less than 50 m^3/day may be determined with test-strips in non-sedimented homogenized sample.
- Oxygen content of facilities with a flow of less than 50 m^3/day may be determined by tablets, otherwise a measuring instrument shall be used.
- The pH value/redox-stress/tension shall be determined by a measuring instrument. For continuous determination by a fixed, installed, self-recording measuring instrument, the instrument shall be checked and adjusted at regular intervals, but at least every 3 months. The pH electrode shall be cleaned daily. The measuring instrument shall be used permanently, even if there is an operating break. Write stripes shall be marked weekly at least once with the date. Data shall be maintained for a minimum of 3 years.
- Temperature shall be determined by a measuring instrument. For continuous determination by a fixed installed, self-recording measuring instrument, the instrument shall be checked and adjusted at regular intervals, at least every 3 months. It shall be used, even if there is an operating break. Write stripes shall be marked at least once per week with the date. Data shall be maintained for 3 years.

C4.3.9.9.8.3 Sampling instruments. In general, inflow controls shall be installed in front of the biological stage. If there is pretreatment, precautions shall be taken so that the sampling instrument can also be used before the pretreatment basin for periodic comparative measurements. Outflow controls shall be installed generally behind the after-treatment basin, for pond-facilities it shall be installed behind the last pond-unit.

C4.3.9.9.9 An operating logbook shall be maintained.

C4.3.10 OPERATOR CONTROL REQUIREMENTS IN BAYERN

The following criteria apply to all wastewater facilities that discharge wastewater with permit obligation into surface water or with license obligation into collecting systems.

C4.3.10.1 Operator Controls. Operators of these facilities shall perform operator controls as required. Performing the required controls may be delegated to third parties; however, the overall responsibility remains with the operator. The operator is also responsible for meeting all other required obligations.

C4.3.10.1.1 Operators responsible for performing necessary controls, shall employ sufficient personnel with appropriate knowledge and education. Additionally,

all facilities shall be equipped with necessary measurement and control instruments. These shall be operated and maintained in an orderly manner.

C4.3.10.2 Operating logbook and annual report. An operating logbook shall be maintained. Summarized and evaluated results of the operator controls performed during the year shall be submitted in an annual report to the water control authority by March 1 of the following year. The operating logbook, all entries, and the annual report can be substituted with the appropriated printouts when using automatic data processing systems.

C4.3.10.3 Wastewater Facilities for Biologically Degradable Wastewater.

C4.3.10.3.1 These requirements apply to municipal and non-municipal wastewater treatment facilities that have a biological treatment phase. This may or may not be combined with chemical and/or mechanical treatment phase. It also applies to improvised (temporary, auxiliary) mechanical wastewater treatment facilities, collecting systems for domestic treated wastewater without a central wastewater treatment facility, and for the receiving surface waters that may be affected by discharge. The size of the facility is determined by EW based on BOD_5 daily loads of untreated wastewater (BOD_5 raw). 1 EW = 60 grams BOD_5.

C4.3.10.3.2 Sampling and Measurement Methods

C4.3.10.3.2.1 Hold samples shall be kept in labeled glass bottles with the name of the system, sample identification, sampling point, date, and time. These samples shall be maintained for 7 days, in the dark, and at a temperature of less than 5 ^{o}C.

C4.3.10.3.2.2 For measurements, analytical devices such as a photometer can be used if this leads to results comparable to the requirements of the permit/license. Environmentally compatible measurements are preferred. For outflow-related measurements the following requirements shall be met:

- documentation of personnel qualifications, additional education and training, and responsibilities of personnel performing the controls shall be maintained;
- documentation of the location of measurement devices, any damage that is incurred, malfunctions, service work, and individual procedures associated with their operation shall be maintained;
- documented instructions for use and service of the measurement devices shall be maintained;
- parallel examinations of the hold samples shall be conducted according to procedures presented in Table C4.T36 and according to analytical quality control (AQS) procedures, in the following number:

Analysis frequency	Number of required parallel analyses per year
Less than 1 per month	1
1 per month until less than 1 per week	2
1 per week until less than 1 per day	3
1 per day or more	4

- If the applied analytical measures do not meet the individual requirements, necessary improvement measures or analysis according to the measures outlined in Table C4.T36 shall be implemented.

C4.3.10.3.2.3 Flow monitoring. A weir flowmeter may be used for systems treating less than 1,000 EW and/or systems without electricity. For other systems, a self-recording measuring device capable of satisfying the requirements given in DIN 19559 or equivalent instrument shall be used. Self-recording measuring instruments are to be operated 24 hours a day and their readings annotated with the date and time the readings were made. The measuring instruments shall be calibrated yearly according to the methodology given in DIN 19559. For every fifth calibration, the manufacturing company or other accepted experts shall be used. After changes in construction or the installation of any devices with effects on flow measurements, a control measurement according to the methodology given in DIN 19559 shall be performed. The flow measure control report shall be added to the annual report.

C4.3.10.3.3 An annual report shall be prepared that includes the following data:

- wastewater flow (inflow and outflow);
- concentration of the monitored parameters;
- determination of the yearly wastewater quantity for wastewater fee obliged dischargers;
- use of other waters; and
- amounts of sludge generated and disposed.

C4.3.10.3.3.1 If a third party performs the examinations, the name of the person/company performing the examinations shall be included in the report. The data shall be compared to the established values in the license/permit and evaluated.

C4.3.10.3.4 Manner and Scope of Control. Efforts shall be made to analyze and control:

- conspicuous inflow parameters such as color, odor, oil contamination;

- all important functions related to wastewater clarification and sludge treatment equipment, and all measurement and regulating devices; and
- conspicuous outflow parameters such as sludge content and color.

C4.3.10.3.4.1 This shall be done on each working day for facilities treating less than 5,000 EW; for larger facilities, it shall be performed on a daily basis.

C4.3.10.3.5 The required testing frequencies presented in Table C4.T42 shall be met.

C4.3.10.3.6 Operators are required to examine waters at the place of discharge which have been affected by wastewater discharges at least weekly to insure proper control of sedimentation, washes, odor, color, etc.

C.4.3.10.4 Other Wastewater Facilities.

C4.3.10.4.1 These requirements apply to wastewater treatment facilities that perform decomposition/splitting of emulsions; detoxification of wastewater which contains cyanide, chromate, nitride; neutralization of alkaline or acidic wastewater and thereby separation of heavy metal combinations; precipitation or flock formation of wastewater substances by addition of chemicals; gravity separation and settling/sedimentation or other separation of wastewater substances, except of light substance cutters, for a wastewater flow less than 10 liters/second; ion exchange, filtration, membrane filtration or flotation of wastewater; mixing, buffering, and balancing of wastewater; other physical or chemical treatment of wastewater; and combinations of the above to include sludge dewatering in combination with wastewater disposal, if the previous section does not apply. The requirements also apply to industrial wastewater that requires treatment but is not pretreated by one of the above-mentioned treatment facilities, as well as to the affected surface water.

C4.3.10.4.2 The control requirements do not apply if it can be proved that through implementing other measures or procedures, on a case-by-case basis, that the discharge requirements are met.

C4.3.10.4.3 The size of a facility is determined by limit values (related to the quantity of water that can be treated) established in the permit/license. If no limits are established, the size shall be determined by the total daily inflow in cubic meters (m^3).

C4.3.10.4.4 For system related controls (see Table C4.T42) sampling shall be performed by collecting random samples. For effluent related controls (see Table C4.T43) sampling and pretreatment shall be performed according to the requirements established in the permit/license.

C4.3.10.4.5 Hold samples shall be maintained in labeled glass bottles with the name of the system, sample identification, sampling point, date, and time. These

samples shall be kept for 7 days, in the dark, and at a temperature of less than 5^{o} C.

C4.3.10.4.6 Sampling, measurements, and analysis shall be performed according to the methods presented in Table C4.T36.

C4.3.10.4.6.1 For measurements, analytical devices such as a photometer can be used, if this leads to results comparable to the requirements of the permit/license. Environmentally compatible measurements are preferred. For outflow-related measurements the following minimum requirements shall be met:

- documentation of personnel qualifications, additional education and training, and responsibilities of personnel performing the controls shall be maintained;
- documentation of the location of measurement devices, any damage that is incurred, malfunctions, service work, and individual procedures associated with their operation shall be maintained;
- documented instructions for use and service of the measurement devices shall be maintained;
- parallel examinations of the hold samples shall be conducted according to procedures as listed in Table C4.T36 and according to analytical quality control (AQS) procedures in the following number:

Analysis frequency of:	**Number of required parallel analyses per year**
Less than 1 per month	1
1 per month until less than 1 per week	2
1 per week until less than 1 per day	3
1 per day or more	4

- If the applied analytical measures do not meet the individual requirements, necessary improvement measures or analysis according to the measures outlined in Table C4.T36 shall be implemented.

C4.3.10.4.6.2 For wastewater flow, a self-recording measuring device capable of satisfying the requirements given in DIN 19559 or equivalent instruments shall be used. Self-recording measuring instruments are to be operated 24 hours per day, and their readings annotated with the date and time the readings were made. The measuring instruments shall be calibrated at least yearly according to the methodology given in DIN 19559. For every fifth calibration, the manufacturing company or accepted experts shall be used. After changes in construction or the installation of any

devices with effects on flow measurements, a control measurement according to the methodology given in DIN 19559 shall be performed. The flow measure control report shall be added to the annual report.

C4.3.10.4.6.3 Wastewater discharges of less than 100 m³/day into a public canalization system is measurable by water meters on the fresh-water side. Industrial wastewater shall be evaluated independent from cooling water and domestic wastewater. For batch discharge facilities, the wastewater quantity can be determined by continuously monitoring the treated volume of the charge in agreement with the water control authority.

C4.3.10.4.7 For batch discharge facilities, the proper wastewater treatment related to wastewater specific and treatment specific parameters shall be proved with regard to the requirements of the discharge permit before the introduction of each charge. The results shall be recorded.

C4.3.10.4.8 An annual report shall be prepared that includes the following data:

- wastewater flow (inflow and outflow);
- concentration of the monitored parameters;
- determination of the yearly wastewater quantity for wastewater fee obliged dischargers;
- use of other waters; and
- amounts of sludge generated and disposed.

C4.3.10.4.8.1 If a third party performs the examinations, the name of the person/company performing the examinations shall be included in the report. The data shall be compared to the established values in the license/permit and evaluated.

C4.3.10.4.8.2 If load limit values are contained in the minimum requirements, the absolute and specific loads and production capacities shall be annotated within the annual report.

C4.3.10.4.9 Manner and Scope of Controls. The required testing frequencies are presented in Tables C4.T42 and C4.T43.

C4.3.10.4.9.1 System related controls. Daily visual checks of individual treatment parts and their orderly function and operation shall be performed. For wastewater canals, lines, and basins which are not directly visible and are located prior to the water entering any treatment phases, a visual control, i.e. by TV control or leakage detection measures, shall be performed once every 5 years. For wastewater canals, lines, and basins which are not directly visible and are located after all treatment has been performed, a visual control shall be performed once every 10 years.

C4.3.10.4.9.2 Outflow controlled parameters. Testing shall be performed for those parameters listed in Table C4.T43 that are required by the permit/license. If no permit/license has been issued, those parameters shall be analyzed, for which minimum requirements have been established, if these parameters are to be expected in the wastewater. The wastewater quantity shall always be monitored.

C4.3.10.4.9.3 Hold samples. Facilities with a wastewater inflow of 100m³/day or greater that are required to take samples, shall take outflow hold samples daily as flow proportional, volume proportional, and time proportional samples over the entire discharge period.

C4.3.10.4.9.4 For non-treated wastewater that would require control according to Table C4.T43, if pretreatment facilities would exist, the load per day or charge shall be monitored once per month. The parameters listed in Table C4.T43 shall be monitored. The load at the place of occurrence shall be calculated from a random sample drawn from the arising wastewater quantity per hour or per charge, if not provided by production data. The manner, type, and amount of introduced substances shall also be considered.

C4.3.10.4.9.5 Surface waters at the point of discharge shall be visually examined at least weekly to ensure the proper control of conspicuous parameters such as sedimentation, washes, odor, color, etc. For non-treated wastewater, that would require monitoring in accordance with Table C4.T43, if pretreatment facilities would exist, the visual examinations shall be performed at least quarterly.

C4.3.11 OPERATOR CONTROL REQUIREMENTS IN HESSEN

These criteria apply to all wastewater facilities that are required to be licensed and to wastewater facilities that are regulated.

C4.3.11.1 Responsibilities of Wastewater Treatment Facility Operators. The operator of a wastewater treatment facility shall equip the facility with the necessary devices and measuring equipment and conduct the necessary analyses at their own cost. The scope of the operator controls apply to the requirements established in this regulation, if nothing else is required by the permit/license. If a permit requires examination of the affected surface water, these examinations shall be performed as part of the operator control procedures.

C4.3.11.2 Operator Controls. The controls shall be implemented and performed by the operator of the facility. The operator shall ensure that appropriately trained personnel perform the measurements and analysis.

C4.3.11.2.1 For wastewater system checks, only appropriate technical experts may be used. These system checks are technical inspections that evaluate the proper function and tightness of the system and are based on visual surveys and/or pressure tests.

For systems constructed or repaired prior to 1 January 1999, the first check is to be conducted no later than 31 December 2005, and subsequent checks shall be conducted, at a minimum, once every 10 years.

For systems constructed or repaired after 1 January 1999, the following apply. For sewer lines, the first check shall be performed no later than 15 years after construction or repair. Following the first check, subsequent checks shall be conducted, at a minimum, once every 10 years. For storm water lines, the first check shall be performed no later than 20 years after construction or repair. Following the first check, subsequent checks shall be conducted, at a minimum, once every 10 years.

C4.3.11.2.2 For the control of flow measurement devices and of throttling installations for storm water relief basins, only control authorities certified by the state may be used.

C4.3.11.3 Wastewater that requires minimum examinations shall be examined by a board recognized by the state.

C4.3.11.4 The type and operation of sampling and measurement devices shall be designed to ensure that conditions affecting sampling and sample storage are reduced to a minimum.

C4.3.11.5 Wastewater facilities larger in size than 10,000 EW shall take daily hold samples from the discharged wastewater and maintain them at 4^{o}C until the analysis of the original sample is available, but at a minimum of 7 days. The water authority can implement other or additional requirements in the permit.

C4.3.11.6 Supervising the Discharge of Third Parties. The operator of a municipal wastewater treatment facility shall supervise the discharges of third parties (indirect dischargers) into the facility through regular examinations to the extent that non-domestic waste is discharged. A wastewater cadastral map (indirect discharger register) shall be established that is organized by the catchment area of the treatment facility. The number and type of examinations shall be established by the operator depending on the type and constitution of the wastewater discharged, to include dangerous substances. Parameters regulated by the water permit shall also be considered.

C4.3.11.7 The operator of the municipal facility and the indirect discharger can agree to delegate the operator control responsibilities to the indirect discharger and the examinations required by the operator to a state acknowledged control board. This control board shall perform the examinations without advanced indication and has to submit the results to both the indirect discharger and the facility operator. The control board may not be employed by the indirect discharger.

C4.3.11.8 Indirect dischargers that are not subject to permit obligations, can meet their operator control requirement obligations if they submit their control reports performed by expert control to the operator of the municipal wastewater treatment facility.

C4.3.11.9 An operating logbook shall be maintained.

C4.3.11.10 Proof of Operator Controls. Results of operator controls shall be evaluated and summarized in an annual report, which shall be submitted to the water control authority by March 31 of the following year; direct dischargers shall also submit the report to the technical state authority for environment and geology and indirect dischargers shall also submit their annual reports to the operator of the receiving wastewater treatment facility. The water authority can demand submission of interim reports and reports via electronic data processing.

C4.3.11.11 Obligation for Reporting Changes. Operators of wastewater treatment facilities shall report changes that may effect clarification efficiency, exceeding the treatment capacity of the facility, or cause an undesirable discharge, immediately to the water authority. Indirect dischargers shall also inform the operator of the receiving wastewater treatment facility.

C4.3.11.12 Wastewater Facilities with Biological Processing Phase.

C4.3.11.12.1 These requirements apply to municipal and non-municipal wastewater treatment facilities, in which the wastewater contents can be degraded or reduced by biological procedures only, or in combination with chemical and/or mechanical procedures.

C4.3.11.12.2 Type and Scope of Operator Controls. Regarding the operator controls, an internal monitoring program shall be established, and if requested, it shall be presented to the water authority. The operator is responsible for ensuring requirements are met. The results of all operator controls shall be recorded in an operating logbook. At a minimum, the measurements and investigations presented in Table C4.T44 shall be performed and integrated into the measurement program. If other parameters are required by permit, they shall also be included in the internal monitoring program.

C4.3.11.12.3 Wastewater samples shall be drawn as 2-hour mixed samples or qualified random samples. Fifty percent (50%) of the samples from the inflow and outflow of wastewater treatment facilities shall be taken:

- as 2-hour mixed samples, if the facility is Category 2 and upward - the corresponding flow shall be recorded;
- as flow proportional 24-hour mixed samples, if the facility is Category 4 and upward.

C4.3.11.12.4 All sampling and measurements shall be performed on different weekdays and different days, except for 24-hour mixed samples.

C4.3.11.12.5 The condition and function of important clarification and measurement equipment shall be checked daily for facilities 5,000 EW or larger or checked on every working day for facilities smaller than 5,000 EW.

C4.3.11.12.6 Decisive flow measurement equipment of wastewater treatment facilities with a capacity greater than 2,000 EW in size shall be hydraulically calibrated every 5 years by an EKVO control board.

C4.3.11.12.7 The application of additional treatment agents, energy consumption, acceptance of external substances, and waste removal shall also be recorded.

C4.3.11.12.8 Examination Measures. The type and operation of sampling and measurement devices shall be guaranteed so that conditions affecting sampling and sample storage are kept to a minimum. The most suitable procedures for analysis and measurement and alternative measures shall be applied. Examinations using simplified procedures are possible. Regulations regarding analytical quality guarantee shall be considered. Control may be implemented through the use of online measurements, if these are suitable relating to data evaluation, and if the operating function of the instrument is checked/confirmed at least weekly through laboratory analysis.

C4.3.11.12.9 Operator Control Report. The report shall contain the following:

- data regarding discharged wastewater, applied additional agents, energy consumption, origin, and disposal of residual substances;
- wastewater volume and concentration of parameters, limited by a water legal permit, each with arithmetic average values, 50% and 90% values and with graphic drawing (Ganglinie) for 2-hour and 24-hour mixed sample for COD, total nitrogen, inorganic or total phosphorus, if at least one value per week is measured;
- comparison of the capacity of the wastewater treatment facility and its pollution load;
- for wastewater fee obliged dischargers, the annual polluted wastewater quantity and the annual amount of discharged substances, mentioned by the wastewater fee act, if limited by the water legal permit;
- the proof that flow measurement equipment has been inspected through the submission of the inspection report issued by the state acknowledged control board;
- amount of sand trap residue, rake residue, sludge and other wastes that were generated and disposed; and
- application of additional agents, energy consumption, and acceptance of external substances.

C4.3.11.13 Wastewater Facilities with Chemical, Mechanical, or Chemical-mechanical Processing Phase and Wastewater Facilities for Indirect Discharges with Biological Processing Phase.

C4.3.11.13.1 These requirements apply to municipal and non-municipal wastewater facilities, where non-domestic wastewater is treated by chemical, mechanical, or chemical-mechanical procedures and to indirect discharging wastewater facilities with biological processing phase. It does not apply to wastewater treatment facilities for the treatment of partial wastewater flows, if

its indirect discharge into municipal wastewater treatment facilities is not subject to permit requirements. It also does not apply, if the chemical, mechanical, or chemical-mechanical processing phase is integrated into a direct discharging biological wastewater treatment facility.

C4.3.11.13.2 Operator Controls. Regarding operator controls, an internal monitoring program shall be established and if requested, presented to the water authority. All results shall be recorded in an operating logbook. If no other requirements are established in the permit, the sampling locations contained in the permit, shall be examined by a state acknowledged examination board with following frequencies:

- Wastewater input of less than 10 m^3/day: 2/year
- Wastewater input between 10 and 100 m^3/day: 4/year
- Wastewater input of greater than 100 m^3/day: 6/year

The monitoring frequencies can be reduced if noted in the discharge permit.

C4.3.11.13.3 Sampling. Wastewater samples shall be drawn as 2-hour mixed samples or qualified random samples, if no other requirements are specified in the discharge permit. For batch discharge facilities, random samples are permitted.

C4.3.11.13.4 Wastewater Flow Measures. The wastewater flow shall be measured by a summarizing measurement instrument that records momentary values according to the state of the art. The measurement instruments shall be operated continuously, even during service interruptions in the treatment process.

C4.3.11.13.4.1 For dischargers with a wastewater input of less than 10 m^3/day, the input can be determined by a water counter installed on the fresh water side. Industrial wastewater shall be determined independently of cooling water and domestic wastewater.

C4.3.11.13.4.2 For batch discharge facilities, it is sufficient to determine the number of charges per day and the daily discharge quantities.

C4.3.11.13.4.3 For facilities with an outflow of greater than 150 m^3 per 2 hours, all important flow measurement instruments shall be hydraulically calibrated by an EKVO-board every 5 years.

C4.3.11.13.5 Operator Control Report. At a minimum, the report shall contain the following data:

- Wastewater quantity and results of analysis for parameters required to be monitored by the permit. The data can be presented as single values in tables. The calculation of the arithmetic average values is also required.

- Pollution loads (absolute and specific) and production capacity. The data can be presented as single values in tables. The calculation of the arithmetic average values is also required.
- The proof that flow measurement equipment has been inspected through the submission of the inspection report issued by the state acknowledged control board.
- Amount of waste generated from the wastewater treatment facility and its utilization or disposal.
- A brief description of any major changes during the reporting period, related to the facility and associated production facilities, if these changes show effects on the quantity and composition of the wastewater.

4.3.12 OPERATOR CONTROL REQUIREMENTS IN RHEINLAND-PFALZ

These criteria apply to wastewater treatment facilities that discharge wastewater into receiving waters by permit or into municipal wastewater treatment facilities by license. It applies also to wastewater treatment facilities that discharge cooling water into waters and to mixed water treatment facilities and pump stations. It does not apply to facilities for domestic wastewater with a wastewater input of less than 8 m^3 per day and to storm water facilities.

C4.3.12.1 Operator controls. Efforts shall be made to:

- measure wastewater volume;
- determine the wastewater quality;
- determine the capacity necessary for ensuring proper operation of the facility; and
- determine the degree of degradation and separation of substances or substance groups.

C4.3.12.1.1 The operator of the wastewater treatment facility where primarily biologically degradable wastewater is treated, at a minimum, shall perform the sampling, analyses, and measurements according to the requirements.

C4.3.12.1.2 The operator of wastewater facilities where other wastewater is treated, at a minimum, shall perform the sampling, analysis, and measurements according to the requirements.

C4.3.12.1.3 The operator of wastewater facilities that directly discharge cooling water into other waters, shall control the discharge by monitoring special indicating parameters with regard to harmful changes and report the results to the water authority.

C4.3.12.1.4 Further examinations required by the permit or license shall be integrated into the operator control procedures.

C4.3.12.1.5 The operator control requirements do not apply to indirect dischargers, if according to the Regulation about Indirect Discharge, no license requirements are established.

C4.3.12.2 Examination Measures. Wastewater monitoring shall be accomplished according to the procedures listed in Table C4.T36. Other suitable internal measures may be substituted if this leads to results comparable to the requirements of the permit/license. Environmentally compatible measurements are preferred. The comparability to standard analysis and measurement procedures shall be ensured by measures of analytical quality guarantee.

C4.3.12.2.1 For measurements, analytical devices such as a photometer, can be used, if this leads to results comparable to the requirements of the permit/license. Environmentally compatible measurements are preferred.

C4.3.12.3 Special Status Checks. Operators of wastewater treatment facilities that shall perform status checks at least every 5 years according to the instructions of the producer.

C4.3.12.4 An operating logbook shall be maintained.

C4.3.12.5 Operator Control Report. Operators of wastewater treatment facilities, except mixed water treatment facilities, shall annually report the summarized and evaluated results of the operator controls to the water control authority by March 31 of the following year.

C4.3.12.6 **Wastewater Treatment Facilities for Biologically Degradable Wastewater**

C4.3.12.6.1 These requirements apply to facilities, where substances in the wastewater are reduced or eliminated by biological procedures, and are eventually combined with chemical and/or mechanical procedures.

C4.3.12.6.2 Sampling. Samples shall be taken day and time shifted, if no other requirements are established. Twenty-four (24)-hour mixed samples shall be collected flow or time proportional.

C4.3.12.6.3 Measurement of the Wastewater Volume Steam. The wastewater volume steam for facilities larger than 5000 EW in size shall be continuously measured by a self-recording measuring device. For facilities less than 5000 EW in size, a measurement by a wier *(Messgefäß)* is sufficient. For non-continuous operating facilities a suitable measurement shall be provided.

C4.3.12.6.4 The operator of a wastewater treatment facility shall inspect the monitoring equipment with regard to their operating condition according to the instructions of the manufacturer, but at least every 5 years. The results shall be documented.

C4.3.12.6.5 The addition of extra wastewater or substances for treatment shall be evaluated with regard to the manner of the addition and quantity of the addition.

C4.3.12.6.6 Scope of Controls. Necessary operating parameters (i.e., acid capacity, oxygen content, sludge volume, sludge index, recycled sludge volume, microscopic picture, sight depth, turbidity, energy consumption, temperature, gas emission) for controlling wastewater clarification processes shall be determined to ensure an orderly operation of the facility. On demand of the water authority, proof of the operating parameters shall be provided.

C4.3.12.6.7 The share of other water used shall be determined and reported every 6 months for wastewater treatment facilities, where primarily domestic and municipal wastewater is treated.

C4.3.12.7 Wastewater Treatment Facilities for Other Wastewater.

C4.3.12.7.1 These criteria apply to wastewater treatment facilities, where wastewater is treated by heat or mechanical or chemical (i.e. adsorption, absorption, ion exchange, gravity separation and separation of wastewater substances, neutralization, detoxification of wastewater which contains cyanide, chromate and nitrides, precipitation or flock formation of wastewater substances by addition of chemicals, flotation, splitting of emulsions, membrane filtration) or to facilities that combine these procedures including sludge dewatering related to wastewater removal.

C4.3.12.7.2 Sampling. For system related controls, random samples shall be collected, if no other requirements are specified in the permit or license. For outflow related controls, sampling and treatment shall be performed according to the requirements in the permit/license. If no other requirements are specified, samples shall be collected day and time shifted.

C4.3.12.7.3 Measurement of the Wastewater Flow. The wastewater flow for continuously operated facilities shall be continuously monitored by a self-recording measurement instrument. The operator of a wastewater treatment facility shall control the monitoring instruments with regard to their operating condition according to the instructions of the manufacturer, but at least every 5 years. The results shall be documented.

C4.3.12.7.3.1 Industrial wastewater shall be monitored independent of cooling water and domestic wastewater.

C4.3.12.7.3.2 For batch discharge facilities that operate intermittently, it is sufficient to measure and record the number of charges per day, when discharges occur, and the treated wastewater volume. For discharges into municipal wastewater treatment facilities, the measurement of the wastewater volume, if less than 50 m^3/day, may be accomplished by a water counter on the fresh water side.

C4.3.12.7.4 Types and Scope of Operator Controls. The operator of wastewater facilities shall perform a daily visual inspection of individual treatment components with regard to their orderly operating, damages to the facility, seepage, and in the case of batch discharging facilities, application of any treatments.

C4.3.12.7.5 System Related Controls. Wastewater treatment shall be controlled through the determination of indicating parameters using suitable measures (i.e., an appropriate set of instruments for cyanide, nitrite, chromium determination). This shall be performed on a daily basis for continuous wastewater treatment facilities and after each treatment step, or before the discharge of each batch, from intermittently operating facilities. The results shall be recorded in the operating logbook. Process-related values can be used as the overall indicating parameters for controlling the treatment facility (i.e. pH-value, temperature, conductivity, turbidity, color, absolute pressure, pressure difference), if one can assume that by these values, the requirements are met. pH-electrodes shall be calibrated on a weekly basis. Redox measurement instruments (Redox-*Meßketten*) shall be calibrated at least every 6 months.

C4.3.12.7.6 Outflow-related Controls. The outflow-related operator controls refer to the quality and quantity of treated wastewater at the point of discharge into municipal wastewater treatment facilities (indirect dischargers) or at the point of discharge into surface water (direct discharger), if no other sampling requirements are established by the license/permit. The type and scope of the controls shall be performed according to the requirements established in the permit/license. If no operator control requirements are established in the permit/license, the monitoring in Table C4.T23 shall be performed for the parameters regulated by the license/permit. If no license/permit exists, at a minimum, the parameters that are regulated and are expected in the wastewater shall be monitored with the appropriate frequencies.

C4.3.12.7.6.1 These requirements may not apply to single parameters, if other proofs (i.e. proof by operating logbook about applied raw material and supporting agents) and the individual requirements are met.

C4.3.12.7.7 Special Status Checks. Mixed-water treatment facilities and pump stations shall be visually inspected on a monthly basis with regard to its functional ability and construction condition. Deficiencies shall be immediately addressed and sediment shall be removed immediately.

Table C4.T1 Components of Total Toxic Organics

Volatile Organics	
Acrolein (Propenyl)	Bromodichloromethane
Acrylonitrile	1,1,2,2-Tetrachloroethane
Methyl chloride (chloromethane)	1,2-Dichloropropane
Methyl bromide (bromomethane)	1,3-Dichloropropylene (1,3-Dichloropropene)
Vinyl Chloride (chloroethylene)	Trichloroethene
Chloroethane	Dibromochloromethane
Methylene Chloride (9 dichloromethane)	1,1,2-Trichloroethane
1,1-Dichloroethene	Benzene
1,1-Dichloroethane	2-Chloroethyl vinyl ether (mixed)
1,2-Dichloroethane	Bromoform (tribromomethane)
1,2-trans-Dichloroethene	Tetrachloroethene
Chloroform (trichloromethane)	Toluene
1,1,1-Trichloroethane	Chlorobenzene
Carbon Tetrachloride (tetrachloromethane)	Ethylbenzene
Base/Neutral Extractable Organics	
N-nitrosodimethylamine	Diethyl phthalate
bis (2-chloroethyl) ether	1,2-Diphenylhydrazine
1,3-Dichlorobenzene	N-nitrosodiphenylamine
1,4-Dichlorobenzene	4-Bromophenyl phenyl ether
1,2-Dichlorobenzene	Hexachlorobenzene
bis(2-chloroisopropyl)-ether	Phenanthrene
Hexachloroethane	Anthracene
N-nitrosodi-n-propylamine	Di-n-butyl phthalate
Nitrobenzene	Fluoranthene
Isophorone	Pyrene
bis (2-chloroethoxy) methane	Benzidine
1,2,4-trichlorobenzene	Butyl benzyl phthalate
Naphthalene	1,2-benzoanthracene (benzo (a) anthracene)
Hexachlorobutadiene	Chrysene
Hexachlorocyclopentadiene	3,3-Dichlorobenzidine
2-Chloronaphthalene	bis (2-ethylhexyl) phthalate
Acenaphthylene	Di-n-octyl phthalate
Dimethyl Phthalate	3,4-Benzofluoranthene (benzo (b) fluoranthene)
2,6-Dinitrotoluene	11,12-Benzofluoranthene (benzo (k) fluoranthene)
Acenaphthene	Benzo (a) pyrene (3,4-benzopyrene)
2,4-Dinitrotoluene	Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)
Fluorene	1,2,5,6-Dibenzanthracene (dibenezo (a,h) anthracene)
4-Chlorophenyl phenyl ether	1,12-Benzoperylene (benzo (g,h,i) perylene)
Acid Extractable Organics	
2-Chlorophenol	2,4,6-Trichlorphenol
Phenol	2,4-Dinitrophenol

2-Nitrophenol	4-Nitrophenol
2,4-Dimethylphenol	p-Chloro-m-cresol
2,4-Dichlorophenol	Pentachlorophenol
4,6-Dinitro-o-cresol	
Pesticides/PCBs	
Alpha-Endosulfan	Endrin
Beta-Endosulfan	Endrin aldehyde
Endosulfan sulfate	Heptachlor
Alpha-BHC	Heptachlor Epoxide (BHC-hexachlorocyclohexane)
Beta-BHC	Toxaphene
Delta-BHC	PCB-1242 (Arochlor 1242)
Gamma-BHC	PCB-1254 (Arochlor 1254)
4,4-DDT	PCB-1221 (Arochlor 1221)
4,4-DDE (p,p-DDX)	PCB-1232 (Arochlor 1232)
(p,p-TDE)	PCB-1248 (Arochlor 1248)
Aldrin	PCB-1260 (Arochlor 1260)
Chlordane (technical mixture and metabolites)	PCB-1016 (Arochlor 1016)
Dieldrin	

Table C4.T2 Monitoring Requirements

Facility Capacity MGD *(m^3/day)*	Monitoring Frequency
0.001 - 0.99 *(3.78 – 3783)*	Monthly
1.0 - 4.99 *(3784 – 18919)*	Weekly
> 5.0 *(18920)*	Daily

MGD million gallons per day
m^3/day cubic meters per day

Table C4.T3 Storm water Best Management Practices (BMPs)

Activity	Best Management Practices
Aircraft Ground Support Equipment Maintenance	• Perform maintenance/repair activities inside • Use drip pans to capture drained fluids • Cap hoses to prevent drips and spills
Aircraft/runway deicing	• Perform anti-icing before the storm • Put critical aircraft in hangars/shelters
Aircraft/vehicle fueling operations	• Protect fueling areas from the rain • Provide spill response equipment at fueling station
Aircraft/vehicle maintenance & repair	• Perform maintenance/repair activities inside • Use drip pans to capture drained fluids
Aircraft/vehicle washing	• Capture wash water and send to wastewater treatment facility • Treat wash water with oil water separator before discharge
Bulk fuel storage areas	• Use dry camlock connectors to reduce fuel loss • Capture spills with drip pans when breaking connections • Curb fuel transfer areas, treat with oil water separator
Construction activities	• Construct sediment dams/silt fences around construction sites
Corrosion control activities	• Capture solvent/soaps used to prepare aircraft for painting • Perform corrosion control activities inside
Hazardous material storage	• Store hazardous materials inside or under cover • Reduce use of hazardous materials
Outdoor material storage areas	• Cover and curb salt, coal, urea piles • Store product drums inside or under cover • Reduce quantity of material stored outside
Outdoor painting/depainting operations	• Capture sandblasting media for proper disposal • Capture paint clean up materials (thinners, rinsates)
Pesticide operations	• Capture rinse water when mixing chemicals • Store spray equipment inside
Power production	• Capture leaks and spills from power production equipment using drip pans, etc.
Vehicle storage yards	• Check vehicles in storage for leaks and spills • Use drip pans to capture leaking fluids

Table C4.T4 Limit Values for COD, BOD_5, Total Nitrogen, NH_4-N, and Total Phosphorus for Direct Discharges into Normal Waters from Municipal Wastewater Treatment Facilities

Parameter	Size of the Treatment Facility				
	Category 1	Category 2	Category 3	Category 4	Category 5
COD	150	110	90	90	75
BOD_5	40	25	20	20	15
N_{total}	-	-	-	18	18
NH_4-N	-	-	10	10	10
P_{total}	-	-	-	2	1

Notes:

a. All values are indicated in mg/l

b. The limit values relate to either qualified random samples or 2-hour mixed samples.

c. These values apply to a wastewater temperature of 12°C or more in the discharge pipe of the biological reactor of the wastewater treatment facility.

d. If the samples are collected from a pond facility that is designed for a holding time of 24 hours or more, and the sample is clearly colored by algae, COD and BOD_5 shall be determined from algae-free samples. In this case, the limit values are reduced by 15 mg/l for COD and 5 mg/l for BOD_5.

e. The classification of a discharge facility into one of the size categories is dependent on the capacity of the wastewater treatment facility that is based on the BOD concentration of the untreated wastewater (BOD raw). In cases in which the capacity of a wastewater treatment facility was calculated based only on the BOD value of settled wastewater, the following values are to be used for the classification:

Category 1: <40 kg/d BOD_5 settled
Category 2: 40 to 200 kg/d BOD_5 settled
Category 3: 200 to 400 kg/d BOD_5 settled
Category 4: 400 to 4000 kg/d BOD_5 settled
Category 5: >4000 kg/d BOD_5 settled

f. For nitrogen, less stringent limit values up to 25 mg/l may be permitted by the discharge license or if the reduction of the total nitrogen concentration is at least 70%. The reduction relates to the nitrogen load at the influent compared to the effluent. The load calculation at the inflow is based on organic and inorganic nitrogen.

Table C4.T5 Limit Values for Total Nitrogen and Total Phosphorus for Discharges into Sensitive Areas in Bayern and Rheinland-Pfalz

Parameter	Size of the Facility	Concentration	Minimum Reduction
Total Phosphorus	10,000-100,000 EW > 100,000 EW	2 mg/l 1 mg/l	80 %
Total Nitrogen	20,000-100,000 EW > 100,000 EW	15 mg/l 10 mg/l	70-80%

Table C4.T6 Limit Values for Total Nitrogen and Total Phosphorus for Discharges into Sensitive Areas in Baden-Württemberg

Sensitive area	Size of the Facility	Concentration	Minimum Reduction
Rhine catchment area	10,000 – 100,000 EW > 100,000 EW	2 mg/l P 1 mg/l P	80%
Lake Constance catchment area	600 – 2999 EW 3000 – 29999 EW > 30000 EW	1.5 mg/l P 1.0 mg/l P 0.3 mg/l P	85% 87% 95%
Upper Danube catchment area	600 – 2999 EW > 3000 EW	1.5 mg/l P 1.9 mg/l P	85% 87%
All sensitive areas	10,000 – 100,000 EW > 100,000 EW	15 mg/l N 10 mg/l N	70-80%

Notes:

a. Samples shall be collected from the same points either as outflow proportional or time proportional 24-hour mixed samples.

b. The one-year average shall not exceed the established limits (see Table C4.T37).

Table C4.T7 Deadline for Meeting the Legal Requirements for Installation of a Municipal Wastewater System

State	Size of the Municipal Catchment Area	Deadline
Baden-Württemberg	> 15,000 EW	January 1, 2001
	2000-15,000 EW	January 1, 2006
Bayern	> 15,000 EW	January 1, 2001
	2000-15,000 EW	January 1, 2006
Hessen	>10,000 EW	January 1, 1999
	2000-10,000 EW	January 1, 2006
Rheinland-Pfalz	> 10,000 EW	January 1, 1999
	< 10,000 EW	January 1, 2006

Table C4.T8 Monitoring Requirements at the Outflow of Domestic Wastewater Treatment Facilities in Baden-Württemberg (also see Table C4.T38)

Parameter	Treatment Facility Capacity			
	50 to 1,000 EW	1,000 to 5,000 EW	5,000 to 50,000 EW	> 50,000 EW
BOD_5	m	2 x m	w	w
COD[1]	m	w	2 x w	d
Total filterable substances[4]	-	-	w	w
Total settleable substances	w	d	d	d
pH[1]	w	d	d	d
NH_4-N, NO_3-N[1]	m	w	2 x w	d
Total phosphorus[3]	m	w	2 x w	d
Wastewater flow[1, 2]	d	c	c	c

1 Not required for facilities smaller than 100 EW

2 Not necessary for inflow measurements

3 Only if phosphorus elimination is necessary or existing

4 Only for facilities with filtration

m – monthly, w – weekly, d –daily, c - continuously

Table C4.T9 Monitoring Requirements at the Outflow of Domestic Wastewater Treatment Facilities in Bayern (see also Table C4.T42)

Parameter	Treatment Facility Capacity					
	< 1,000 EW	1,000 to 4,999 EW	5,000 to 19,999 EW	20,000 to 49,999 EW	50,000 to 99,999 EW	> 100,000 EW
BOD_5	4 x a [3, 4]	m [3]	2 x m [3, 4] or m [5]	w [3] or m [5]	2 x w [3] or 2 x m [5]	d [3] or w [5]
COD	4 x a [3, 4]	m [3]	2 x m [3, 4] or m [5]	w [3] or m [5]	2 x w [3] or 2 x m [5]	w [3] or 2 x m [5]
Total filterable substances	-	-	2 x w [3]	d [3]	w [3]	w [3]
Total settleable substances	2 x w [1, 4]	d [2] 2 x w (for pond facilities)	-	-	-	-
pH	2 x w [1, 4]	wd [1]	c	c	c	c
Transparency / turbidity	wd [1, 4]	wd [1]	d [1]	d [1]	c	c
NH_4-N, NO_3-N	4 x a [3, 4]	m [3]	2 x m [3, 4] m [5]	w [3] m [5]	2 x w [3] 2 x m [5]	w [3] 2 x m [5]
NO_2-N	-	-	-	m [3]	m [3]	2 x m 3
Total Phosphorus	4 x a [3, 4]	m [3]	2 x m [3, 4] m [5]	w [3] m [5]	2 x w [3] 2 x m [5]	w [3] 2 x m [5]
Wastewater flow	w [1]	c	c	c	c	c

[1] Momentary value
[2] Random sample
[3] 2-hour mixed sample
[4] Qualified random sample
[5] 24-hour mixed sample

m – monthly, w – weekly, d –daily, c - continuously

Table C4.T10 Monitoring Requirements at the Outflow of Domestic Wastewater Treatment Facilities in Hessen (see also Table C4.T44)

Parameter	Treatment Facility Capacity				
	< 1000 EW	1000 to 5000 EW	5000 to 10,000 EW	10,000 to 100,000 EW	> 100,000 EW
BOD_5	m	w	w	w	w
COD	m	w	w	w	w
NH_4-N	-	m	w	d	d
Total nitrogen, inorganic[1]	-	m	w	d	d
Kjeldahl-Nitrogen[2]	-	m	m	m	m
Total phosphorus	-	m	w	d	d
Wastewater flow[3]	c, 24 h	c, 24 h	c, 2 h	c, 2 h	c, 2 h

[1] Sum of NH_3, NO_2-N and NO_3-N

[2] Sum of N_{inorg} and NH_4-N

[3] Continuous measurement, recording of 2-hour or 24-hour sum values of the flow

m – monthly, w – weekly, d –daily, c - continuously

Table C4.T11 Monitoring Requirements at the Outflow of Domestic Wastewater Treatment Facilities in Rheinland-Pfalz

Parameter	Treatment Facility Capacity					
	< 1,000 EW	1,000 to 5,000 EW	5,000 to 10,000 EW	10,000 to 100,000 EW	> 100,000 EW	Type of sample collection[4]
BOD_5	m	w	w	w	w	2, 3, 4
COD	m	w	w	w	wd[2] w[1]	2, 3, 4
Total filterable substances	-	m/4 x a[3]	m	2 x m	w	1
Total settleable substances	w	w	d	d	d	1
pH	w	d	c	c	c	1
Nitrogen total	-	-	m	w	wd[2] w[1]	2, 3, 4
Phosphorus total	-	-	-	w	wd[2] w[1]	2, 3, 4
Wastewater flow	w	w	c	c	c	5

[1] If the parameter is continuously monitored by online-measurements, the daily average shall be documented.

[2] If no continuously online-measurements are applied

[3] Monthly for the first year, quarterly for the following years. If 1 of 4 samples exceeds the limit value, 12 samples shall be taken in the following year.

[4] Type of sample collection
- 1 = random sample
- 2 = 2-hour mixed sample
- 3 = qualified random sample
- 4 = 24-hour mixed sample
- 5 = corresponding 24-hour mixed sample

m – monthly, w – weekly, d –daily, c - continuously

Table C4.T12 Limit Values for Specific Indirect Discharge Parameters*

Parameter	Limit Value
Non-volatile lipophilic substances	
• Direct separable (DIN 38409 part 19)	100 mg/l
• Total[1] (DIN 38409 part 19)	250 mg/l
Hydrocarbons	
• Direct separable (DIN 38409 part 19)	50 mg/l[2]
• Total (ISO 9377-2)	100 mg/l
• Total, if further elimination is required (ISO 9377-2)	250 mg/l
Halogenated organic compounds	
• AOX	1 mg/l
• LHKW (as sum of Trichloroethene, Tetrachloroethene, 1,1,1-Trichlorethene, Dichloromethylene - all calculated as chlorine)	0.5 mg/l
Organic solvents, halogen free Partly or totally with water mixable and biologically degradable (DIN 38412, part 25): corresponding to special definitions, but not more than appropriate to the solubility or more than 5 g/l	
Inorganic substances[2]	
• Antimony	0.5 mg/l
• Arsenic	0.5 mg/l
• Barium	5 mg/l
• Lead	1 mg/l
• Cadmium [3]	0.5 mg/l
• Chrome	1 mg/l
• Chrome-VI	0.2 mg/l
• Cobalt	2 mg/l
• Copper	1 mg/l
• Nickel	1 mg/l
• Selenium	2 mg/l
• Silver	1 mg/l
• Mercury	0.1 mg/l
• Tin	5 mg/l
• Zinc	5 mg/l
• Aluminum and Iron	No limit, if there are if no difficulties associated with the operation of the treatment facilities.

Parameter	Limit Value
Inorganic substances (dissolved)	
• Nitrogen from NH_4-N and NH_3	100 mg/l < 5000 EW 200 mg/l > 5000 EW
• Nitrogen from NO_2, if larger loads arise	10 mg/l
• Cyanide	20 mg/l
• Cyanide, easily releasable	1 mg/l
• Sulfate [4]	600 mg/l
• Sulfide	2 mg/l
• Fluoride	50 mg/l
• Phosphate compounds [5]	50 mg/l
Other organic substances	
• Volatile (by steam) halogen free phenols [6]	100 mg/l
• Dye stuff	Only in concentrations such that the receiving water body is not be visibly stained after discharge
Spontaneous oxygen consumption According to the German standard procedure about water, wastewater and sludge analysis "Determination of spontaneous oxygen demand (G24)", 17 Edition, 1986	100 mg/l

* These values represent the basis for the establishment of local municipal drainage statutes. It should be noted that municipalities may adopt more stringent requirements. Personnel responsible for wastewater management should contact the local authorities to identify specific requirements.

1 DIN 1999 parts 1 - 6 shall be considered.

2 Parameters with requirements according to "state of the art."

3 For Cadmium, the limit value defined for sewage sludge may be exceeded, if less than 10%.

4 On an individual basis, higher values may be permitted depending on the type of building material, dilution, and other area-specific conditions.

5 On an individual basis, higher values may be permitted if the operation of the wastewater treatment facility is not affected.

6 Depending on the type of the phenolic substance, this value may be higher; for toxic and biologically non- or partially-degradable phenols it shall be lower.

Table C4.T13 Effluent Limits for the Industrial Category "Electroplating of Common Metals"

Pollutant	Daily Maximum	4-Day-Average	2-hour mixed sample or qualified random sample (mg/l)
Aluminum	-	-	3
NH_4-N	-	-	100
COD	-	-	400
Iron	-	-	3
Fluoride	-	-	50
Hydrocarbons	-	-	10
Phosphorus	-	-	2
Fish Toxicity	-	-	6
AOX	-	-	1
TTO **< 38,000 l/d** **> 38,000 l/d**	 4.57 2.13	-	-
Arsenic	-	-	0.1
Lead	0.6	0.4	0.5
Cadmium **mg/l** **kg/T**[3]	 1.2	-	 0.2 0.3
Chlorine, free	-	-	0.5
Chromium	7.0	-	0.5
Chromium VI	-	-	0.1
Cyanide, easily releasable	5.0 [1]	-	0.2
Cyanide, total	1.9	1.0	-
Copper	4.5	-	0.5
Nickel	4.1	-	0.5
Silver	1.2 [2]	-	0.1
Sulfide	-	-	1
Tin	-	-	2
Zinc	4.1	-	2
Total metals	10.5	6.8	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

[3] The unit kg/T is based on the load for an electroplating process, operated with maximum capacity related to the number of batch(es) processed during an 8-hour period. This process related load is also specified in permits issued by the water authorities (Einleitgenehmigung). In this example, the value kg/T is the mass of Cadmium in the wastewater related to the total mass of Cadmium used in the electroplating process in one batch with the system operating at maximum efficiency. The limit value for Cadmium is met when the concentration in the wastewater from the batch is below 0.2 mg/l.

Table C4.T14 Effluent Limits for the Industrial Category "Electroplating of Precious Metals"

Pollutant	Daily Maximum	4-Day-Average	2-hour mixed sample or qualified random sample(mg/l)
Aluminum	-	-	3
NH_4-N	-	-	100
COD	-	-	400
Iron	-	-	3
Fluoride	-	-	50
Hydrocarbons	-	-	10
Phosphorus	-	-	2
Fish Toxicity	-	-	6
AOX	-	-	1
TTO **< 38,000 l/d** **> 38000 l/d**	 4.57 2.13	-	-
Arsenic	-	-	0.1
Lead	0.6	0.4	0.5
Cadmium **mg/l** **kg/T**[3]	 1.2	-	 0.2 0.3
Chlorine, free	-	-	0.5
Chromium	7.0	-	0.5
Chromium VI	-	-	0.1
Cyanide, easily releasable	5.0 [1]	-	0.2
Cyanide, total	1.9	1.0	-
Copper	4.5	-	0.5
Nickel	4.1	-	0.5
Silver	1.2 [2]	-	0.1
Sulfide	-	-	1
Tin	-	-	2
Zinc	4.1	-	2
Total metals	10.5	6.8	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

[3] The unit kg/T is based on the load for an electroplating process, operated with maximum capacity related to the number of batch(es) processed during an 8-hour period. This process related load is also specified in permits issued by the water authorities (Einleitgenehmigung). In this example, the value kg/T is the mass of Cadmium in the wastewater related to the total mass of Cadmium used in the electroplating process in one batch with the system operating at maximum efficiency. The limit value for Cadmium is met when the concentration in the wastewater from the batch is below 0.2 mg/l.

Table C4.T15 Effluent Limits for the Industrial Category "Anodizing"

Pollutant	Daily Maximum	4-Day-Average	2-hour-mixed sample or qualified random sample (mg/l)
Aluminum	-	-	3
NH_4-N	-	-	-
COD	-	-	100
Iron	-	-	-
Fluoride	-	-	50
$N0_2$-N	-	-	5
Hydrocarbons	-	-	10
Phosphorus	-	-	2
Fish Toxicity	-	-	2
AOX	-	-	1
TTO **< 38,000 l/d** **> 38,000 l/d**	 4.57 2.13	-	-
Lead	0.6	0.4	-
Cadmium	1.2	-	-
Chromium	7.0		0.5
Chromium VI	-	-	0.1
Cobalt	-	-	1
Cyanide, easily releasable	5.0 [1]	2.7 [1]	-
Cyanide total	1.9	1.0	-
Copper	4.5	2.7	-
Nickel	4.1	2.6	-
Selenium	-	-	-
Silver	1.2 [2]	0.7 [2]	-
Sulfide	-	-	-
Tin	-	-	2
Zinc	4.1	-	2
Total metals	10.5	6.8	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

Table C4.T16 Effluent Limits for the Industrial Category "Metal Coatings"

Pollutant	Daily Maximum	4-Day-Average	2-hour-mixed sample or qualified random sample (mg/l)	
			Hardening	Metal coatings
Aluminum	-	-	-	2
NH_4-N	-	-	50	20
COD	-	-	400	100
Iron	-	-	-	3
Fluoride	-	-	-	50
$N0_2$-N	-	-	5	5
Hydrocarbons	-	-	10	10
Phosphorus	-	-	2	2
Fish Toxicity	-	-	6	4
AOX	-	-	1	1
TTO **< 38,000 l/d** **> 38,000 l/d**	 4.57 2.13	-	-	-
Barium	-	-	2	-
Lead	0.6	0.4	-	0.5
Cadmium	1.2	0.7	-	0.2
Chlorine, free	-	-	0.5	-
Chromium	7.0	-	-	0.5
Chromium VI	-	-	-	0.1
Cobalt	-	-	-	1
Cyanide, easily releasable	5.0 [1]	-	1	-
Cyanide, total	1.9	1.0	-	-
Copper	4.5	-	-	0.5
Nickel	4.1	-	-	0.5
Selenium	-	-	-	1
Silver	1.2 [2]	0.7 [2]	-	-
Sulfide	-	-	-	1
Zinc	4.1	-	-	2
Total metals	10.5	6.8	-	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

Table C4.T17 Effluent Limits for the Industrial Category "Chemical Etching and Milling"

Pollutant	Daily Maximum	4-Day-Average	2-hour-mixed sample or qualified random sample (mg/l)
Aluminum	-	-	3
NH_4-N	-	-	30
COD	-	-	100
Iron	-	-	3
Fluoride	-	-	20
$N0_2$-N	-	-	5
Hydrocarbons	-	-	10
Phosphorus	-	-	2
Fish Toxicity	-	-	4
AOX	-	-	1
TTO **< 38,000 l/d** **> 38,000 l/d**	 4.57 2.13	-	-
Lead	0.6	0.4	-
Cadmium mg/l	1.2	-	-
Chlorine, free	-	-	0.5
Chromium	7.0	-	0.5
Chromium VI	-	-	0.1
Cyanide, easily releasable	5.0 [1]	-	-
Cyanide, total	1.9	1.0	-
Copper	4.5	-	0.5
Nickel	4.1	-	0.5
Silver	1.2 [2]	-	-
Sulfide	-	-	1
Zinc	4.1	-	2
Total metals	10.5	6.8	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

Table C4.T18 Effluent Limits for the Industrial Category "Electroless-Plating"

Pollutant	Daily Maximum	4-Day-Average	2-hour-mixed sample or qualified random sample (mg/l)	
			Burnishing	Fire zincing and tinning
NH_4-N	-	-	30	30
COD	-	-	200	200
Iron	-	-	3	3
Fluoride	-	-	-	50
$N0_2$-N	-	-	5	-
Hydrocarbons	-	-	10	10
Phosphorus	-	-	2	2
Fish Toxicity	-	-	6	6
AOX	-	-	1	1
TTO < 38,000 l/d > 38,000 l/d	 4.57 2.13	-	-	-
Lead	0.6	0.4	-	0.5
Cadmium mg/l	1.2	-	-	0.1
Chlorine, free	-	-	0.5	-
Chromium	7.0	-	0.5	-
Chromium VI	-	-	0.1	-
Cyanide, easily releasable	5.0 [1]	2.7 [1]	-	-
Cyanide total	1.9	1.0	-	-
Copper	4.5	2.7	-	-
Nickel	4.1	-	0.5	-
Silver	1.2 [2]	0.7 [2]	-	-
Sulfide	-	-	1	-
Tin	-	-	-	2
Zinc	4.1	-	-	2
Total metals	10.5	6.8	-	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

Table C4.T19 Effluent Limits for the Industrial Category "Printed Circuit Board Manufacturing"

Pollutant	Daily Maximum	4-Day-Average	2-hour-mixed sample or qualified random sample (mg/l)
NH_4-N	-	-	50
COD	-	-	600
Iron	-	-	3
Fluoride	-	-	50
Hydrocarbons	-	-	10
Phosphorus	-	-	2
Fish Toxicity	-	-	6
AOX	-	-	1
TTO **< 38,000 l/d** **> 38,000 l/d**	 4.57 2.13	-	-
Arsenic	-	-	0.1
Lead	0.6	0.4	0.5
Cadmium mg/l	1.2	0.7	-
Chromium	7.0	-	0.5
Chromium VI	-	-	0.1
Cyanide, easily releasable	5.0 [1]	-	0.2
Cyanide total	1.9	1.0	-
Copper	4.5	-	0.5
Nickel	4.1	-	0.5
Silver	1.2 [2]	-	0.1
Sulfide	-	-	1
Tin	-	-	2
Zinc	4.1	2.6	-
Total metals	10.5	6.8	-

[1] for discharge <38,000 l/d

[2] for discharge >38,000 l/d

Table C4.T20 Monitoring Requirements for Effluent Parameters of other Wastewater Facilities in Baden-Württemberg

Parameter	Treatment Facility Capacity		
	< 50,000 l/d	50,000 – 500,000 l/d	> 500,000 l/d
Volume	d	c	c
pH	c	c	c
Temperature	w	c	c
Conductivity	d	d	d
Settlable substances	d	d	2 x d
BOD_5	2 x m	w	w
COD	2 x w	d	d
Group 1 (NH_4-N, NO_2-N, Chlorine free, Chromium VI, Cyanide easily releasable, Cyanide total)	w	2 x w	d
Group 2 (Phosphorus total, Fluoride, all metals except Chromium VI)	q	m	w
Group 3 (Hydrocarbons, AOX)	q	6 x a	m
TTO	q	q	q

a – annually, q – quarterly, m – monthly, w – weekly, d –daily, c - continuously

Table C4.T21 Monitoring Requirements for Effluent Parameters of other Wastewater Facilities in Bayern

Parameter	Treatment Facility Capacity		
	< 10,000 l/d	10,000 – 100,000 l/d	> 100,000 l/d
Volume	d	c	c
pH	c	c	c
Temperature [1]	w	d	c
Turbidity [1]	-	c	c
BOD_5 [1]	m	w	2 x w
COD [1]	m	w	d
Group 1 [1] (NH_4-N, NO_2-N, Phosphorus total, Fluoride, Iron, Aluminum)	m	w	d
Group 2 (Cyanide easily releasable, Chlorine, Sulfide, Chromium VI, heavy metals except Iron)	m	w	2 x w
Group 3 (AOX, Hydrocarbons)	2 x a	q	m
TTO	q	q	q
Total metals	q	q	q

[1] only for direct discharges

q – quarterly, m – monthly, w – weekly, d –daily, c - continuously

Table C4.T22 Monitoring Requirements for Effluent Parameters of other Wastewater Facilities in Hessen

Parameter	Treatment Facility Capacity		
	< 10,000 l/d	10,000 – 100,000 l/d	> 100,000 l/d
All limited parameters limited by the discharge permit	2 x a	q	6 x a
Parameters not limited by the discharge permit (Cyanide total, Copper, Nickel, Chrome, Zinc, Lead, Cadmium, Total metals, TTO, Silver)	q	q	q

a - annually, q - quarterly

Table C4.T23 Monitoring Requirements for Effluent Parameters of other Wastewater Facilities in Rheinland-Pfalz

Parameter	Treatment Facility Capacity		
	< 10,000 l/d	10,000 – 50,000 l/d	> 50,000 l/d
Volume	c	c	c
pH	c	c	c
Temperature	c	c	c
Group 1 [1](COD, NH4-N, NO2-N, Phosphorus total)	m	m	w
Group 2 (Cyanide lf, Chlorine, Chrome VI)	m	w	2 x w
Group 3 (Heavy metals, Sulfide)	6 x a	m	w
Group 4 (Hydrocarbons, AOX)	q	6 x a	m
Group 5 (other substances or groups)	q	q	6 x a
TTO	q	q	q
Total metals	q	q	q

[1] only for direct discharges

a – annually, q – quarterly, m – monthly, w – weekly, c - continuously

Table C4.T24 MCLs for Wastewater from Drinking Water Processing

Parameter	MCL as a Qualified Random Sample or 2-hour Mixed Sample	MCL as a Random Sample
Filterable substances	50 mg/l	-
Arsenic[1]	0.1 mg/l	-
AOX[1]	-	0.2 mg/l
AOX in regenerative water of ion exchangers[1]	-	1 mg/l

[1] This is only required if the parameter is to be expected in the wastewater and the requirement is contained in the permit or license.

Table C4.T25 MCLs for Wastewater from Fresh Water Cooling Systems (through flow or outflow)

Parameter	MCL as a Qualified Random Sample or 2-hour Mixed Sample
Chlorine Dioxide, Chlorine and Bromine (measured as Chlorine)	0.2 mg/l
AOX	0.15 mg/l

Table C4.T26 MCLs for Wastewater from the Outflow of Circulation Cooling Systems of Power Facilities

Parameter	MCL as a Random sample
COD	30 mg/l
Total phosphorus	1.5 mg/l
Inorganic Phosphorus Compounds as Total Phosphorus[1]	3 mg/l
AOX[2]	0.15 mg/l
Chlorine Dioxide, Chlorine and Bromine (indicated as Chlorine)[2]	0.3 mg/l
Bacteria illumination inhibition G_L[2]	12

[1] If only inorganic phosphorus compounds are introduced, the total phosphorus value of 3 is applicable.
[2] After application of a pulse treatment with microbial agents.

Table C4.T27 MCLs for Wastewater from the Discharge of other Circulation Cooling Systems

Parameter	MCL as a Random Sample
COD	40 mg/l
COD after clarification with dispersing agents	80 mg/l
Phosphorus compounds (as Total Phosphorus)	3 mg/l
Phosphorus compounds as Total Phosphorus (if only zinc-free cooling water conditioning agents are applied)	4 mg/l
Phosphorus compounds as Total Phosphorus (if applied zinc-free cooling water conditioning agents only contain inorganic phosphorus)	5 mg/l
Zinc	4 mg/l
AOX	0.15 mg/l
Chlorine Dioxide, Chlorine and Bromine (indicated as Chlorine)[1]	0.3 mg/l
AOX[1]	0.5 mg/l
Bacteria illumination inhibition G_L[1]	12

[1] After application of a pulse treatment with microbial agents

Table C4.T28 MCLs for Wastewater from Other Facilities During Steam Production

Parameter	MCL as a Qualified Random Sample or 2-hour Mixed Sample	MCL as a Random Sample
COD	50 mg/l	
COD for wastewater from condensate desalting	80 mg/l	
Phosphorus compounds as total phosphorus	3 mg/l	
Total nitrogen	10 mg/l	
Zinc[1]	1 mg/l	
Chromium[1]	0.5 mg/l	
Cadmium[1]	0.05 mg/l	
Copper[1]	0.5 mg/l	
Lead[1]	0.1 mg/l	
Nickel[1]	0.5 mg/l	
Vanadium[1]	4 mg/l	
Hydrazine[1]		2 mg/l
Chlorine, free[1]		0.2 mg/l
AOX[1]		0.5 mg/l

[1] This is only required if the parameter is expected in the wastewater and the requirement is contained in the permit or license.

Table C4.T29 MCLs for Wastewater Discharges at the Point of Discharge from Battery Production (8), Mechanical Workshops (10), Gliding Grinding Works (11), and Paint Shops (12) Associated with Metal Works and Metal Processing

Parameter	Industrial Category			
	8	10	11	12
Aluminum	-	3 mg/l	3 mg/l	3 mg/l
NH_4-N	50 mg/l	30 mg/l	-	-
COD	200 mg/l	400 mg/l	400 mg/l	300 mg/l
Iron	3 mg/l	3 mg/l	3 mg/l	3 mg/l
Fluoride	-	30 mg/l	-	-
$N0_2$-N	-	5 mg/l	.	-
Hydrocarbons	10 mg/l	10 mg/l	10 mg/l	10 mg/l
Phosphorus	2 mg/l	2 mg/l	2 mg/l	2 mg/l
Fish Toxicity (G_f)	6	6	6	6

Notes:

a. Samples shall be qualified random samples or 2-hour-mixed samples

b. Requirements for hydrocarbons relate only to the collection of a random sample.

c. For electroplating of glass the requirement for fish toxicity applies only with the dilution factor $G_F = 2$.

Table C4.T30 MCLs for Wastewater Discharges Before Mixing with Other Water from Battery Production (8), Mechanical Workshops (10), Gliding Grinding Works (11), and Paint Shops (12) Associated with Metal Works and Metal Processing

Parameter	Industrial Category			
	8	10	11	12
AOX	1 mg/l	1 mg/l	1 mg/l	1 mg/l
Arsenic	0.1 mg/l	-	-	-
Barium	-	-	-	-
Lead	0.5 mg/l	0.5 mg/l	-	0.5 mg/l
Cadmium	0.2 mg/l 1.5 kg/T	0.1 mg/l	-	0.2 mg/l
Chlorine, free	-	0.5 mg/l	-	-
Chromium	-	0.5 mg/l	0.5 mg/l	0.5 mg/l
Chromium VI	-	0.1 mg/l	-	0.1 mg/l
Cobalt	-	-	-	-
Cyanide, easily releasable	-	0.2 mg/l	-	-
Copper	0.5 mg/l	0.5 mg/l	0.5 mg/l	0.5 mg/l
Nickel	0.5 mg/l	0.5 mg/l	0.5 mg/l	0.5 mg/l
Mercury	0.05 mg/l 0.03 kg/T	-	-	-
Selenium	-	-	-	-
Silver	0.1 mg/l	-	-	-
Sulfide	1	-	-	-
Tin	-	-	-	-
Zinc	2 mg/l	2 mg/l	2 mg/l	2 mg/l

Notes:
a. Samples shall be qualified random samples or 2-hour-mixed samples

Table C4.T31 MCLs for Wastewater at the Point of Discharge from an Area of Above Ground Deposit of Waste

Parameter	MCL
COD	200 mg/l
BOD_5	20 mg/l
Nitrogen, total	70 mg/l
Phosphorus, total	3 mg/l
Hydrocarbons, total	10 mg/l
NO_2-N	2 mg/l
Fish Toxicity (G_F)	2

Notes:
a. Samples shall be qualified random samples or 2-hour-mixed samples.

Table C4.T32 MCL for Wastewater from an Area of Above Ground Deposit of Waste Before Mixing with Other Water

Parameter	MCL as a Qualified Random Sample or 2-hour mixed sample
AOX[1]	0.5 mg/l
Mercury	0.05 mg/l
Cadmium	0.1 mg/l
Chrome	0.5 mg/l
Chrome VI[1]	0.1 mg/l
Nickel	1 mg/l
Lead	0.5 mg/l
Copper	0.5 mg/l
Zinc	2 mg/l
Arsenic	0.1 mg/l
Cyanide, easily releasable[1]	0.2 mg/l
Sulfide[1]	1.0 mg/l

[1] Values apply to random samples

Notes:
a. Samples shall be qualified random samples or 2-hour-mixed samples

Table C4.T33 Requirements for AOX in Wastewater Before Mixing with Other Water

Filling Capacity of the Dry Cleaning Machine	AOX Concentration of Random Sample	1-hour Throughout of the Facility Capacity (from a random sample and the 1-hour water volume)
< 50 kg goods to be cleaned	0.5 mg/l	-
> 50 kg goods to be cleaned	0.5 mg/l	0.25 mg/kg

Table C4.T34 MCLs for Wastewater Originating from Photo Treatment Baths

Parameter	MCL as a Qualified Random Sample or 2-hour Mixed Sample	MCL as a Random Sample
Silver	0.7 mg/l	-
AOX	-	0.5 mg/l
Chromium, total	0.5 mg/l	-
Chromium VI	-	0.1 mg/l
Tin	0.5 mg/l	-
Mercury	0.05 mg/l	-
Cadmium	0.05 mg/l	-
Cyanide, total	2 mg/l	-

Table C4.T35 Requirements for Rinse Water for Photographic Development Facilities with a Film and Paper Throughput of More Than 3,000 m²/year

Film and Paper Throughput	Silver Load (mg/m²)
Greater than 3000 to 30,000 m²/year	
- Black/white and x-ray photography	50
- Color photography	70
Greater than 30,000 m²/year	30

Table C4.T36 Approved Analytical Test Methods

Parameter	Method
General Methods	
Directives for sampling techniques	DIN EN 25667-2
Sampling from wastewater	DIN 38402-A 11
Wastewater flow	Corresponding to DIN 19559
Pre-treatment, homogenizing, and splitting of heterogeneous water samples	DIN 38402-A 30
Analytical Methods	
Anions / Elements	
Boron, in the unfiltered sample	DIN EN ISO 11885 (506)
Chloride	DIN EN ISO 10304-2
Cyanide, easily releasable	DIN 38405-D 13-2
Cyanide, in the unfiltered sample	DIN 38405-D 13-1
Fluoride, total in the unfiltered sample	DIN 38405 –D4-2
NO_3-Nitrogen	DIN EN ISO 10304-2
NO_2-Nitrogen	DIN EN 26777
Phosphorus, total in the unfiltered sample	DIN EN 1189 (6.4)
Phosphate compounds as total phosphorus, in the unfiltered sample	DIN EN ISO 11885 (596)
Sulfate	DIN EN ISO 10304-2
Sulfide, easily releasable	DIN 38405-D 27
Sulfite	DIN EN ISO 10304-3
Cations / Elements	
Aluminum, in the unfiltered sample	DIN EN ISO 11885 (506)
NH_4-Nitrogen	DIN EN ISO 11732
Antimony, in the unfiltered sample	DIN EN ISO 11885 (506)
Arsenic, in the unfiltered sample	DIN EN ISO 11969 (506)
Barium, in the unfiltered sample	DIN EN ISO 11885 (506)
Lead, in the unfiltered sample	DIN 38406-E 6-2
Cadmium, in the unfiltered sample	DIN EN SIO 5961
Calcium, in the unfiltered sample	DIN EN ISO 11885 (506)
Chrome, in the unfiltered sample	DIN EN ISO 11885 (506)
Chrome (VI)	DIN 38405-D 24
Cobalt, in the unfiltered sample	DIN EN ISO 11885 (506)

Parameter	Method
Iron, in the unfiltered sample	DIN EN ISO 11885 (506)
Copper, in the unfiltered sample	DIN EN ISO 11885 (506)
Nickel, in the unfiltered sample	DIN EN ISO 11885 (506)
Mercury, in the unfiltered sample	DIN EN 1483
Silver, in the unfiltered sample	DIN EN ISO 11885 (506)
Thallium, in the unfiltered sample	DIN 38406-E 26
Vanadium, in the unfiltered sample	DIN EN ISO 11885 (506)
Zinc, in the unfiltered sample	DIN EN ISO 11885 (506)
Tin, in the unfiltered sample	DIN EN ISO 11885 (506)
Selenium, in the unfiltered sample	DIN 38405-E 23-2
Gallium, in the unfiltered sample	According to DIN EN ISO 11885 (506)
Indium, in the unfiltered sample	According to DIN EN ISO 11885 (506)
Manganese, in the unfiltered sample	DIN EN ISO 11885 (506)
Single substances, sum parameters, group parameters	
TSS, in the unfiltered sample	DIN EN 872
AOX, in the unfiltered sample indicated as Chloride	DIN EN 1485; adsorption according to section 8.2.2 (501)
COD, in the unfiltered sample	DIN 38409-H 41
COD, in the unfiltered sample without H_2O_2	DIN 38409-H 41; deduction of the H_2O_2 affected COD share
TOC (total organic carbon), in the unfiltered sample	DIN EN 1484 (502))
TNb (total bound Nitrogen), in the unfiltered sample	DIN V ENV 12260; burning temperature higher than 700°C shall be kept for complete mineralization
H_2O_2	DIN 38409-H 15
Non-volatile lipophilic substances (extractable), in the unfiltered sample	DIN 38409-H 17; application of petrolether in boiling phase 40-60°C as extraction agent
Hydrocarbons, total in the unfiltered sample	DEV V H 53; application of petrolether in boiling phase 40-60°C as extraction agent
Direct separable lipophilic light substances, in the unfiltered sample	DIN 38409-H 19, average of 2 samples
Phenol index after distillation and dye extraction, in the unfiltered sample	DIN 38409-H 18-2
Chlorine, total	DIN 38408-G 4-1
Chlorine, free	DIN 38408-G 4-1
Hexachlorbenzol, in the unfiltered sample	DIN 38407-F 2

Parameter	Method
Trichlorethene, in the unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
1,1,1,-Trichlorethane, in the unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Tetrachlorethene, in the unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Trichlormethane, in unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Tetrachlormethane, in unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Dichlormethane, in unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Hydrazine	DIN 38413-P 1
Tensides, anionic	DIN EN 903
Tensides, non-ionic	DIN 38409-H 23-2
Tensides, cationic	DIN 38409-H 20
Bismuth complex index (Ibik)	DIN 38409-H 26
Aniline, in the unfiltered sample	DIN EN ISO 10301, section 2, extraction with Dichloromethane at pH 12, GC-separation at e.g., DB 17 and OV 101. N-P-Detector
Hexachlorcyclohexane, as sum of all isomers	DIN 38407-F 2 (504)
Hexachlorbutadien (HCBD), in the unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Aldrine, Dieldrine, Endrine, Isodrine (Drines), in the unfiltered sample	DIN 38407-F 2 (504)
Volatile organically bound halogens, in the unfiltered sample indicated as chloride	DEV H 25, at room temperature blowing out for 10 minutes
1,2-Dichlorethane, in the unfiltered sample	DIN EN ISO 10301, application according to liquid/liquid-extraction procedure
Trichlorobenzole as sum of all isomers, in the unfiltered sample	DIN 38407-F 2 (504)
Endosulfane as sum of all isomers, in the unfiltered sample	DIN 38407-F 2 (504)
Benzole and derivatives, in the unfiltered sample	DIN 38407-F-9-1 (504); instead of KaCO3 1 to 3 g NaSO4 per 5 ml sample shall be applied. In section 3.8.3 the value “8.78 µg/l” is substituted by “878 µg/l”
Sulfide and mercaptane sulfur, in the unfiltered sample	(503)

Parameter	Method
Polycyclic aromatic hydrocarbons (PAH), in the unfiltered sample (Fluoranthene, Benzo (a) pyrene (3,4-Benzopyrene), Benzo (b) fluoranthene (3.4-Benzofluoranthene), Benzo (g,h,i) perylene (1,12-Benzoperylene), and Indeno (1,2,3-cd) pyrene (2,3-o-Phenylene pyrene))	DIN 38407-F 8 (504)
Chlorinedioxide and other oxidizing agents, indicated as chlorine	DIN 38408-G 5; measures against interference according to section 4 are not to be applied
Coloring	DIN EN ISO 7887, section 3
Biological Test Procedures	
Guidelines for sampling and performing of biological test procedures	DIN EN ISO 5667-16
Fish toxicity (G_F), in the unfiltered sample	DIN 38412-L 31; in section 9.1 indicated *Korpulenzindex* and body length do not apply. The fish shall be 1 year old, but not older than 15 month, and 5 to 12 cm long. (505)
Daphnia toxicity (G_D), in the unfiltered sample	DIN 38412-L 30 (505)
Algae toxicity (G_A), in the unfiltered sample	DIN 38412-L 33; the reference “if no inhibition more than 20% could be registered for higher dilutions” in section 3.5 does not apply; annotation in section 11.1 does not apply (505)
Bacteria illuminating inhibition (G_L) in the unfiltered sample	DIN 38412-L 34 combined with DIN 38412-L 341; a dilution has to be performed with distilled water instead of the indicated common salt solvent (505)
Easy aerobic biological degradation ability of substances	Appendix of EU-Directive 92/69/EWG for 17. adjustment to Directive 67/548/EWG
Aerobic biological degradation ability of substances	DIN EN 29888; Degradation ability is determined as DOC degradation degree over 28 days. *Belebtschlamm-Inoculum* 1 g/l dry stuff per test. Water hardness may reach 2.7 mmol/l. Outblown and adsorbed substances are not considered for the result. The result is indicated as degree of degradation. Preadapted inocula are not allowed.

Parameter	Method
Aerobic biological degradation ability in biological treatment facilities (elimination ability) of filtered sample	DIN EN 29888; Degradation ability is determined as COD or DOC degradation degree. The inoculum of the real treatment facility with 1g/l dry stuff in the testing arrangement shall be applied (section 8.3). The duration of the elimination test corresponds to the time required for achieving the elimination degree of the total wastewater amount of the real wastewater treatment facility in the test simulation. The COD concentration in the test (100 – 1000 mg/l) should correspond to the real conditions. The water hardness of the testing water should not exceed the hardness of the tested wastewater. Outblown substances are not considered for the result. The elimination degrees refer to the COD concentrations at the beginning of the test under subtraction of stripping shares. The result shall be indicated al degree of elimination.
BOD_5	DIN EN 1899-1
Inheritance	DIN 38415-T 3

Table C4.T37 Reference Methods for Controls and Resulting Evaluations

1. A control method shall be applied that complies with the following requirements (other methods than those referenced in No. 2, 3 and 4, can be applied, if equivalent results can be achieved).
2. At the outflow and, if necessary at the inflow, samples shall be collected from the same determined places, as flow proportional or time proportional 24-hour samples in order to determine if the discharged wastewater complies with the requirements of this regulation.

   Internationally accepted laboratory procedures shall be applied in order to minimize any changes to the sample condition between sampling and analysis.
3. The minimum number of yearly samples should be determined according to the size of the domestic wastewater treatment facility. Samples shall be taken in regular intervals according to the following schedule:

2000 – 9999 EW:	12 samples in the first year 4 samples in the following years, if it can be shown that the wastewater complied with the requirements of this regulation in the first year. If one of the samples has exceeded the limit value, 12 samples shall be collected in the following year.
10,000 – 49,000 EW	12 samples per year
> 50,000 EW	24 samples per year

4. For the treated wastewater, the limit values are considered to be met, if for each individual parameter, the sample results comply with the following requirements:
   - For $CBOD_5$, COD, and total suspended solids (TSS), Table C4.T37a indicates the maximum number of samples that are permitted to exceed the established limits and have the system still meet the requirements of this regulation.
   - For $CBOD_5$, COD, and total suspended solids (TSS), the deviation of the given parameter concentration under normal operating conditions may not exceed 100%; for TSS deviations up to 150% are permitted.
   - For phosphorus and total nitrogen, the yearly average may not exceed the established limit.
5. Extreme values of wastewater pollution are not considered, as long these exceptional situations are related to storm water events.

Table C4.T37a Maximum Number of Samples Permitted to Exceed the MCL with the System Maintaining Compliance with the Regulatory Requirements

Total Number of Samples Collected Per Year	Maximum Number of Samples Permitted to Exceed the MCL
4-7	1
8-16	2
17-28	3
29-40	4
41-53	5
54-67	6
68-81	7
82-95	8
96-100	9
101-125	10
126-140	11
141-155	12
156-171	13
172-187	14
188-203	15
204-219	16
220-235	17
236-251	18
252-268	19
269-284	20
285-300	21
301-317	22
318-334	23
335-350	24
351-365	25

Table C4.T38 Required Monitoring for Wastewater Treatment Facilities with a Biological Processing Phase in Baden-Württemberg

Abbreviations:

d - daily or per charge – monitoring shall be performed for wastewater treatment facilities with a capacity of less than 5000 EW at least 5 days per week; for larger facilities at least 6 days per week; and for commercial and industrial facilities, every work-day on which wastewater from the facility is introduced into a domestic wastewater treatment facility.

w - weekly

m - monthly

y - yearly

c - continuously or per charge

	MONITORING FREQUENCY BASED ON THE SIZE OF WASTEWATER TREATMENT FACILITY IN EW			
REQUIRED ANALYSIS	= 50 < 1,000	= 1,000 < 5,000	= 5,000 < 50,000	> 50,000
General monitoring				
Inflow, overflow, outflow for obstruction	d[1]	-	-	-
Functioning of the important technical instruments in the wastewater treatment facility	d[1]	d	d	d
Inflow preclarification				
Wastewater flow[2,3]	d	c	c	c
pH[2]	d	d	c	c
BOD_5[2]	m	m	m	w
Inflow biology				
Wastewater inflow[2,3]	d	c	c	c
Settlable substances[4]	w	d	d	d
BOD_5, COD, NH_4-N[2]	6/y	m	m	w
P_{total}[5]	6/y	m	m	w
Biological stage				
Oxygen content	w	c	c	c
Sludge volume[1]	d	d	d	d
Sludge dry substance	m	w	2/w	d
Sludge index	m	w	2/w	d
Organic dry substance of sludge	-	-	m	w

Water temperature	w	2/w	d	c
pH value	-	2/w	d	c
Microbiological sludge picture	-	w	w	w
Denitrifying basin pH value	-	2/w	d	d
NO_3-N	-	w	d	d
Biofilter/dip body				
Visual control of the surface of the biofilter and dip body	w	d	d	d
Settlable substances in the outflow of the biofilter and before, during and after the flush	w	d	d	d
Water temperature in the biofilter outflow	w	2/w	d	d
Precipitation and flocculation instruments				
Chemical stock	w	d	d	d
Control of the functioning of the chemical dosing	d	d	d	d
After-clarifying basin				
Visual depth[6]	d	d	d	d
Turbidity measurement[6]	-	-	d	c
Outflow of the facility				
Wastewater flow[2,7]	d	c	c	c
Settlable substances	w	d	d	d
Filterable substances[8]	-	-	w	w
pH value[3]	w	d	d	d
BOD_5	m	2/m	w	w
COD, NH_4-N, NO_3-N[2]	m	w	2/w	d
P_{total}[5]	m	w	2/w	d
WASTEWATER PONDS				
Inflow				
Wastewater flow[2,3]	d	c	c	c
BOD_5, COD, NH_4-N[2] pond units	m	m	m	m
Height of the sludge (deposition/sedimentation-height)	y	2/y	-	-
Outflow				

Wastewater flow[2,7]	d	c	c	c
Settlable substances	w	w	d	d
pH value[2]	w	w	w	w
BOD_5, COD, NH_4-N, NO_3-N[2]	m	m	w	w
Surface waters				
Visual control	m	m	w	w
COD, NH_4-N[2]	2/y	4/y	4/y	4/y
P_{total} [5]	2/y	4/y	4/y	4/y
SLUDGE TREATMENT FACILITY				
Sludge amount (addition/removal)	d	d	d	d
Dry-substance (addition/removal)	w	w	w	w
Organic dry substance (annealing loss) of the sludge	w	w	w	w
Mineral dry substance (annealing loss) of the sludge	w	w	w	w
Temperature[9]	c	c	c	c
pH value[9]	d	d	d	d
Organic acids [9,10]	w	w	w	w
BOD_5, NH_4-N[11]	m	m	m	m
P_{total} [5,11]	m	m	m	m
Sludge dewatering/drying				
Functionality	at start up			
Settlable substances [12]	m	m	m	m
Sludge amount (dewatered)	per dewatering charge			
Dry substance of the dewatered wastewater sludge	m	m	m	m
BOD_5, NH_4-N[12]	m	m	m	m
P_{total} [5,12]	m	m	m	m
Mobile facilities /systems: Monitoring of sludge dewatering shall be performed at least once each time it is used.				

Footnotes:

[1] Size of the facilities smaller than 100 EW: weekly
[2] Not for facilities with a size smaller than 100 EW

[3] Not necessary for outflow measurement
[4] Only for biofilter and dip body facilities
[5] As far as phosphorus elimination is required or present
[6] (d): In each case at different day-times
[7] Not necessary for inflow measurement
[8] Only for facilities with filtration
[9] Only for mesophile or thermophile facilities
[10] For facilities with a size of 50,000 EW and more
[11] In the turbid-water-return-flow
[12] In the filtrate, centrifuge etc. - according to the operation

TableC4.T39 Required Monitoring for Wastewater Treatment Facilities Without a Biological Processing Phase in Baden-Württemberg

Abbreviations:

d - daily or per charge – monitoring shall be performed for wastewater treatment facilities with a capacity of less than 50 m^3 at least 5 days per week; for larger facilities at least 6 days per week; and for commercial and industrial facilities, every work-day on which wastewater from the facility is introduced into a domestic wastewater treatment facility.

w - weekly

m - monthly

y - yearly

c - continuously or per charge

REQUIRED ANALYSIS	FREQUENCY - ALL SIZE FACILITIES
Inflow, overflow, and outflow	
Visually	d
Basin, container, in and outflow lines of above ground or underground wastewater treatment facilities	
Visually for leaks	y
Measuring instruments for the pH-value, redox-stress/tension, oxygen, temperature	
Function	d
Cleaning of the electrodes	d
Readjustment of the electrodes	w
Comparison of the reading of the fixed measuring instrument with a hand measuring instrument	w
Adjustment of the out-of-limits indicator	w
Warning, signal, and alarm-systems	
Function	w
Dosing facilities	
Visually for leaks	d
Container (liquid) level	d
Function of the solenoid operated valve for dosing chemicals	d
Overturn installation	
Function	d
Other important instruments or facility elements, which are important for the wastewater treatment facility	
Function	d

Table C4.T40 Required Monitoring for Wastewater Treatment Facilities Without a Biological Processing Phase in Baden-Württemberg

Abbreviations:

d - daily or per charge – monitoring shall be performed for wastewater treatment facilities with a capacity of less than 50 m^3 at least 5 days per week; for larger facilities at least 6 days per week; and for commercial and industrial facilities, every work-day on which wastewater from the facility is introduced into a domestic wastewater treatment facility.

w - weekly

m - monthly

y - yearly

c - continuously or per charge

REQUIRED ANALYSIS	Frequency Based on Wastewater Volume in m^3/day		
	< 50	= 50 to 500	> 500
At emulsion separators			
Arise points for proper separation	m	m	m
Inflow for the presence of cyanide, nitrite, and chromate[1]	d	d	d
Operating efficiency	w	w	w
At continuously operating facilities with cyanide, nitrite, and chromate detoxification			
Arise points for proper separation	m	m	m
Inflow for presence of cyanide, nitrite, and chromate[1]	2/w	d	d
Outflow for pH value, redox-tension	c	c	c
Outflow for the presence of cyanide, nitrite, chromate, chloride, sulfate, and sulfide	d	d	d
Neutralization facilities			
Arise points for proper separation	m	m	m
Inflow for absence of cyanide, nitrite, and chromate[1]	2/w	d	d
Outflow for pH-value	c	c	c
Precipitation and flocculation facilities			
Arise points for proper separation	m	m	m
Effect of COD treatment[2]	2/y	m	w
Precipitation and flocculation means	2/y	m	m
Outflow for the presence of cyanide, nitrite, and chromate[1]	d	d	d

Precipitation/settling facilities			
Visual	m	m	m
Outflow for:			
- settleable substances	d	2/d	4/d
- visual depth	d	d	d
- sludge depth	m	m	m
Filtration facilities			
Outflow for settleable substances	d	2/d	4/d
Light or high gravity solid separator/grease separator			
Sludge depth	m	m	m
Separator deposit/thickness	m	m	m
After treatment control	According to operating instructions		
Sludge dewatering			
Facility functionality	at start-up		
Filtrate, settleable substances	d	d	d
Filtrate, COD[2]	2/y	m	m
Dewatered wastewater sludge for:			
- dry substances[2]	m	m	w
- sludge amount	per dewatering charge		
Mobile facilities/systems:	Shall check sludge dewatering factors above at least once during each use		
General parameters			
Wastewater quantity	d	c	c
pH value	c	c	c
Temperature	w	c	c
Conductivity	d	d	d
Settlable substances	d	d	2/d
BOD_5	2/m	w	w
COD	2/w	d	d
Additional parameters:			
Group 1: ammonium-nitrogen, nitrate-nitrogen, nitrite-nitrogen, chrome VI, uncombined active chlorine, cyanide	w	2/w	d

Group 2: phosphorus total, boron, chloride, fluoride, hydrazine, sulfate, sulfide, difficulty volatile lipophilic substances (extractable), all metals with the exception of chrome IV	4/y	m	w
Group 3: adsorbable organic bonded halogens (AOX), phenolic-index, hydrocarbons, high-volatile halogenated hydrocarbons (HKW), benzene, toluene, xylene.	2/y	6/y	m
Footnotes: [1] Testing to confirm that substances are not in the wastewater need not be done if it can be shown that the process has no chance of introducing the substance into the waste stream or if a test was conducted earlier in the waste stream and found the process to be in compliance. [2] As far as the treatment has an effect on COD reduction.			

Table C4.T41 Approved Wastewater Examination Methods in Baden-Württemberg

Parameter	Reference
Visual depth/Turbidity	DIN 38404-C4-2,3,4 or –5
Water temperature	DIN 38404-C4-1 or –2
pH-value	- Electrometrical to DIN 38404-C5 - With pH-paper
Oxygen	According to Winkler DIN 38404-C6 electrometrical
Redox tension	DIN 38404-C6
Settlable substances - volume share - mass concentration	 DIN 38409-H9-2 DIN 38 409-H10
Filterable substances	DIN 38409-H2-2
Ability to purify	DEV H22.2
BOD_5	- Dilution method DIN 38409-H51 - Respirometrical
COD	- DIN 38409-H41 - Photometrical rapid analysis
NH_4-N	- After distillation DIN 38405-E5-1 or-2 - Photometrical rapid analysis
NO_3-N	- After distillation DIN 38405-D9-1-2 - Photometrical rapid analysis
Phosphate, ortho	- DIN 38405-D11-1 - Photometrical rapid analysis
Phosphorus, total	- DIN 38405-D11-4 - After oxidative digestion by photometrical rapid analysis
Sludge volume	NA
Sludge index	NA
Annealing loss	DIN 38414-S3
Annealing residue	DIN 38414-S3
Dry Substance	DIN 38414-S2

Table C4.T42 Required Monitoring Wastewater Treatment Facilities With a Biological Processing Phase in Bayern

EXAMINATION POINT	PARAMETER	FREQUENCY	TYPE OF SAMPLE	COMMENTS ON PURPOSE AND METHODS
WASTEWATER TREATMENT FACILITIES TREATING FROM 0 TO 999 EW				
Treatment facility	weather	2/week		record the previous day
Inflow point	wastewater temperature & pH-value	2/week	momentary value	
Sedimentation pond	sludge level	quarterly		medium and low water level above the sludge of the first third of the pond
Biological Portion				
Inflow	BOD_5, COD	quarterly	2-hour mixed sample	shaken sample, while the weather is dry, if there is no pretreatment, 3 minute sedimentation is necessary
Occupancy bowl, aerated portion	oxygen content	2/week	momentary value	
	sludge volume	2/week	random sample	
	dry substance content, sludge index	1/week	random sample	
Biofilter	feeding	every work day		record the operating hours
Dip body outflow	oxygen content	1/week	momentary value	
	outflow	1/week	momentary value	short time measurement

Outflow	outflow	1/week	momentary value	short time measurement
	inflow (in agreement with water control authority)	quarterly		external water determination while there is lowest inflow, minimum interval of 2 months
Settling ponds inflow and outflow (systems with post-treatment settling ponds)	pH value visual-depth settleable substances	2/week every work day 2/week	momentary value or qualified random sample	
	methylene-blue-test	2/week	random sample	
	BOD_5, COD,(NH_4-N, NO_3-N)[3], P_{total}	quarterly	2 hour mixed sample or qualified random sample[4]	shaken sample, sample without algae[1]
Settling pond outflow	BOD_5, COD, (NH_4-N, NO_3-N), P_{total}	quarterly	qualified random sample	shaken sample
Wastewater ponds	sludge volume	1/year		middle and low water level over sludge in the first third of the pond
Whole/entire system	wastewater sludge output (wet, drained)	sample in accordance with the output		record the date, the quantity, dry substance content, customer destination
	filter residue, rake residue, sandtrap residue	in accordance with the output		record the date, the quantity, the whereabouts

	energy consumption (total) current consumption, maximum of current delivery	weekly		record the kWh and the max. kW for the entire system and the biological part (includes return flow)
WASTEWATER TREATMENT FACILITIES TREATING FROM 1000 TO 4999 EW				
Treatment facility	weather, air temperature	every work day		record for the previous day
Inflow	wastewater temperature, pH value	2/week	momentary value	
Settling pond	sludge level	quarterly		medium and lowest water level above the sludge of the first third of the pond
Biological Portion				
Inflow	BOD_5, COD	1/month	24-hour mixed sample, 2- hour mixed sample[1]	flow/volume proportional, shaken sample, while the weather is dry, if there is no pretreatment, 3 minute sedimentation is necessary
Occupancy-bowl, aerated portion	oxygen content	every work day	momentary value	
	sludge volume[2]	every work day	random sample	
	dry substance content[2](sludge-index)[2]	1/month (1/week)	random sample	
Biofilter	feeding	every work day		record the operating hours

Dip body	oxygen content	1/week	momentary value	
Outflow	wastewater outflow (inflow in agreement with water control authority)	continuously		
		every work day		lowest and highest flow in l/s and m^3/hr, record the momentary value
		monthly		determination of the wastewater and wastewater quantity
		monthly		external water determination while there is lowest inflow
Settling ponds inflow & outflow (systems with post-treatment settling ponds)	pH value visual depth	every work day	momentary value	
	settleable solids	every work day 2/week[4]	random sample	
	methylene-blue-test[2]	2/week	random sample	
	BOD_5, COD, (NH_4-N, NO_3-N)[3], P_{total}	1/month 6/year[4]	2 hour mixed sample qualified random sample[4]	flow/volume proportional, shaken sample sample without algae[1]
Outflow settling pond	BOD_5, COD, NH_4-N, NO_3-N, P_{total}	quarterly	qualified random sample	shaken sample
Wastewater ponds	sludge level	yearly		middle and low water level over sludge in the first third of the pond
Sludge treatment portion	feeding	every work day		record the raw sludge quantity in m^3
	pH value	every work day	momentary value	

	sludge dry substance, annealing loss	once per month		
	sludge removal	every work day		record the date, the quantity and the whereabouts of sludge and of muddy water
Whole/entire system	wastewater sludge output (wet, drained)	in accordance with the output		record the date, quantity, dry-substance content, customer, destination
	filter residue, rake residue, sandtrap residue	in accordance with the output		write down the date, amount, and the whereabouts
	energy consumption, maximum of current delivery	every work day		record the kWh and the max. kW for the entire system and the biological part (includes the return flow)
WASTEWATER TREATMENT FACILITIES TREATING FROM 5000 TO 19,999 EW				
Treatment facility	weather, air temperature	daily		record for the previous day
Inflow	pH value	continuously		record the 1/4 hour lasting highest and lowest value
Biological Portion				
Inflow	BOD_5, COD	2/month	24 hour mixed sample	flow/volume proportional; while the weather is dry, shaken sample, if there is no pretreatment 3-minute sedimentation is necessary
Occupancy bowl	oxygen content per each bowl unit	3 times per each work day	momentary value	
	sludge volume per each bowl unit	daily	random sample	

	dry substance content, sludge index per each bowl unit	2/week	random sample	
	dry substance content of the return flow sludge	2/month	random sample	
	microscopic picture	1/week		
Biofilter	feeding	every work day		write down the operating hours
Dip body	oxygen content per each first and last bowl unit	2/week	momentary value	
Outflow	wastewater temperature	daily	momentary value	
Outflow	wastewater	continuously		
	outflow / inflow (in agreement with water authority)	daily		lowest and highest flow in l/s and m^3/hr, reading of the counter
		monthly		determination of the wastewater and wastewater water quantity
		monthly		external water determination while there is lowest inflow
Outflow & inflow of settling ponds (systems with post-treatment settling ponds)	pH value	continuously		record daily the 1/4 hour lasting of highest and lowest value
	filterable substances	2/week	2-hour mixed sample	does not apply to pond facilities
	visual depth / turbidity	daily	momentary value	

	BOD_5, COD, NH_4-N, NO_3-N, P_{total}[2]	2/month	2-hour mixed sample qualified random sample[1]	flow/time proportional; flow proportional sample shaken; sample algaefree[1]
		monthly	24-hour mixed sample	same as for 2-hour mixed sample
Outflow of settling pond	BOD_5, COD, NH_4-N, NO_3-N, P_{total}	1/month	qualified random sample	shaken sample
Wastewater ponds	sludge level	yearly		middle and low water level over sludge in first third of the pond
Sludge treatment Portion	feeding	daily		record the raw sludge volume in m^3
	temperature	continuously		record daily the 1/4 hour lasting highest and lowest value
	pH value	every work day	momentary value	
	sludge dry sub-substance, annealing loss	1/month		of the raw sludge and the stabilized sludge
	gas amount	daily		in m^3
	CO_2 respectively CH_4 (sewage gas)	3/week	momentary value	
	sludge removal	daily		record the date, amount, dry substance content and whereabouts of sludge, and muddy water
Whole/entire system	wastewater sludge output (wet, drained)	in accordance with the output		record the date, amount, dry-substance content, customer, destination

	filter residue, rake residue, sandtrap residue	in accordance with the output		record the date, amount and the whereabouts
	energy consumption (total) current consumption, maximum of current delivery	daily		record the kWh and the max. kW for the entire system and the biological part (includes return flow)
WASTEWATER TREATMENT FACILITIES TREATING 20,000 TO 49,999 EW				
Treatment facility	weather, air temperature	daily		record for the previous day
Inflow	pH value	continuously		record daily the 1/4 hour lasting highest and lowest value
Biological portion				
Inflow	BOD_5, COD, N_{total}, P_{total}	1/week	24-hour mixed sample, sample shaken	flow/volume proportional, take when weather is dry, if there is no pretreatment, 3 min. sedimentation is necessary
Occupancy bowl	oxygen content per each bowl unit	continuously		record the 1/4 hour lasting highest and lowest value
	sludge volume per each bowl unit	daily	random sample	
	dry substance content, sludge-index per each bowl unit	3/week	random sample	

	dry substance content of the return flow sludge	1/week	random sample	
Biofilter	feeding	daily		record the operating hours
	microscopic picture	2/week		
Outflow	wastewater temperature	daily	momentary value	
Outflow	wastewater outflow / inflow (in agreement with water control authority)	continuously		
		daily		lowest and highest flow in l/s and m^3/hr, reading of the counter
		monthly		determination of the wastewater and wastewater water quantity
		1/month		external water determination while there is lowest inflow
Outflow & inflow of settling ponds	pH value	continuously		record daily the 1/4 hour lasting highest and lowest value
(Systems with post-treatment settling ponds)	filterable substances	daily	2 hour mixed sample	
	Visual depth	daily	Momentary value	
	restored samples	continuously	2 hour mixed sample	flow proportional, daily mixed to a 24- hour mixed sample
	BOD_5, COD, NH_4-N NO_3-N, P	1/week	2-hour mixed sample	flow/volume proportional, shaken sample
		1/month	24-hour mixed sample	as for 2-hour mixed sample
	NO_2-N	1/month	2-hour mixed sample	flow/volume proportional

Outflow of settling pond	BOD_5,COD,NH_4N NO_3-N,P	1/month	qualified random sample	sample shaken
Sludge treatment portion	feeding	daily		record the war sludge amount in m^3
	temperature	continuously		record daily the 1/4 hour lasting highest and lowest value
	pH value	daily	momentary value	
	sludge dry substance, annealing loss	1/month		of the raw sludge and the stabilized sludge
	gas amount	daily		in m^3
	CO_2 respectively CH_4 (digester)	3/week	momentary value	
	sludge removal	daily		record the date, amount, dry substance content, and whereabouts of sludge and muddy water
Whole/entire system	wastewater sludge output (wet, drained)	in accordance with the output		record the date, amount, dry substance content, customer, destination
	filter residue, rake residue, sandtrap residue	in accordance with the output		record the date, amount, dry substance content, customer, destination
	energy consumption (total current consumption maximum of current delivery	daily		record the kWh and the max. kW for the entire system and the biological part (include return flow)
WASTEWATER TREATMENT FACILITIES TREATING 50,000 TO 99,999 EW				

Treatment facility	weather	daily		record for the previous day
Inflow	pH value	continuously		record daily the 1/4 hour lasting highest and lowest value
Biological Portion				
Inflow	BOD_5, COD, N_{total} [1], P_{total}	2/week	24-hour mixed sample, sample shaken	flow/volume proportional, if there is no pretreatment, 3 min. sedimentation is necessary
Occupancy bowl	oxygen content per each bowl unit	continuously		record the 1/4 hour lasting highest and lowest value
	sludge volume per each bowl unit	daily	random sample	
	dry substance content, sludge-index per each bowl unit	4/week	random sample	
	dry substance content of the return flow sludge	1/week	random sample	
	microscopic picture	2/week		
Biofilter	feeding	daily		record the operating hours
	microscopic picture	2/week		
Outflow	wastewater temperature	daily	momentary value	
Outflow	wastewater outflow / inflow (in agreement with water control	continuously		
		daily		lowest and highest flow in l/s and m^3/hr, reading of the counter
		monthly		determination of the wastewater and wastewater water amount

	authority)	1/month		external water determination while there is lowest inflow
Outflow & inflow of settling ponds (systems with post-treatment settling ponds)	pH value, turbidity	continuously		record daily the 1/4 hour lasting highest and lowest value
	filterable substances	1/week	2 hour mixed sample	
	restored samples	continuously	2 hour mixed sample	flow/volume proportional, daily mixed to a 24- hour mixed sample
	BOD_5, COD	2/week	2-hour mixed sample	flow proportional, shaken sample
		2/month	24-hour mixed sample	as for 2-hour mixed sample
	NO_2-N	1/month	2-hour mixed sample	flow/volume proportional, shaken sample
	NH_4-N, NO3-N, P_{total}	2/week 1/week2	2-hour mixed sample	flow/volume proportional, shaken sample
		2/month	24-hour mixed sample	as for 2-hour mixed sample
				record daily the 1/4 hour lasting highest and lowest value
		2/week		calculation and record of 2-hour average value
		2/month		calculation and record of 24-hour average value
		continuously		record daily the 1/4 hour lasting highest and lowest value

Outflow of settling pond	BOD_5,COD,NH_4-N NO_3-N,P	2/month	2-hour mixed sample	sample shaken
Sludge treatment portion	feeding	daily		record the raw sludge amount in m^3
	temperature	continuously		record daily the 1/4 hour lasting highest and lowest value
	pH value	daily	momentary value	
	sludge dry substance, annealing loss	1/month		of the raw sludge and the stabilized sludge
	gas amount	daily		in m^3
	CO_2 respectively CH_4 (digester)	3/week	momentary value	
	sludge removal	daily		record the date, amount, dry substance content, and whereabouts of sludge and muddy water
Whole/entire system	wastewater sludge output (wet, drained)	in accordance with the output		record the date, amount, dry substance content, customer, destination
	filter residue, rake residue, sandtrap residue	in accordance with the output		record the date, amount, dry substance content, customer, destination
	energy consumption (total current consumption maximum of current delivery	daily		record the kWh and the max. kW for the entire system and the biological part (include return flow)
WASTEWATER TREATMENT FACILITIES TREATING 100,000 EW OR MORE				

Treatment facility	weather	daily		record for the previous day
Inflow	pH value	continuously		record daily the 1/4 hour lasting highest and lowest value
Biological Portion				
Inflow	BOD_5,COD,N_{total}, P_{total}	1/week	24-hour mixed sample, sample shaken	flow proportional, if there is no pretreatment, 3 min. sedimentation is necessary
Occupancy bowl	oxygen content per each bowl-unit	continuously		record daily the 1/4 hour lasting lowest and highest value
	sludge volume per each bowl unit	daily	random sample	
	dry substance content; sludge-index per each bowl unit	every workday	random sample	
	dry substance content of the return flow sludge	every workday	random sample	
	microscopic picture	every work day		
Biofilter	feeding	daily		record the operating hours
	microscopic picture	Every workday		
Outflow	wastewater temperature	daily	momentary value	
	wastewater outflow /	continuously		

Outflow	inflow (in agreement with water control authority)	continuously		
		daily		lowest and highest flow in l/s and m^3/h, reading of the counter
		monthly		determination of the wastewater and wastewater water amount
		1/month		external water determination while there is lowest influx
Outflow & inflow of settling ponds **(systems with post-treatment settling ponds)**	pH value, turbidity	continuously		record daily the 1/4 hour lasting highest and lowest value
	filterable substances	1/week	2 hour mixed sample	
	restored samples	continuously	2 hour mixed sample	flow proportional, daily mixed to a 24- hour mixed sample
	BOD_5	daily	2-hour mixed sample	flow proportional, mixed sample
		1/week	24-hour mixed sample	like the 2-hour mixed sample
	NO2-N	2/month	2-hours mixed sample	flow/volume proportional
	COD, NH_4-N, NO_3-N, P_{total}	1/week daily	2-hour mixed sample	flow/volume proportional; sample shaken
		2/month 1/week	24-hour mixed sample	like the 2-hour mixed sample
	NH_4-N, NO_3-N, PO_4-P, TOC (in	continuously		daily record of 1/4 hour lasting highest and lowest value
		daily		calculation and record of the 2-hour average-value

	agreement with water control authority: NH_4-N, NO_3-N, PO_4-P in the biological reactor)	2/week		calculation and record of the 24-hour average-value
Outflow pond	BOD_5, COD, NH_4-N, NO_3-N,PTotal	1/week	2 hour mixed sample	shaken sample
Test basin/bowl for bioaccumulation	Hg, Cd, Cr, Ni, Cu, Pb; halogen organic compounds	yearly, before settling and after fishing		examination of the fish-meat of the used carp
Sludge treatment portion	feeding	daily		record the raw sludge amount in m^3
	temperature	continuously		record daily the 1/4 hour lasting highest and lowest value
	pH value	daily	momentary value	
	sludge dry substance, annealing loss	1/month		of the raw sludge and the stabilized sludge
	gas amount	daily		in m^3
	CO_2 respectively CH_4 (digester gas)	3/week	momentary value	
	sludge removal	daily		record the date, amount, and the whereabouts of sludge and muddy water
Whole/entire system	wastewater sludge output (wet drained)	in accordance with the output		record, write down the date, amount, dry substance content, customer, destination
	filter residue, rake residue, sandtrap residue	in accordance with the output		record the date, amount and whereabouts

	energy consumption (total) current consumption maximum of current delivery	daily		record the kWh and the max. kW for the entire system and the biological part (includes return flow)

Table C4.T43 Required Checks for Wastewater Treatment Facilities Without a Biological Processing Phase in Bayern

Abbreviations:

d - daily or per charge - examinations shall be done for wastewater treatment facilities less than 50 m^3 in size at least 5 days per week, for bigger facilities at least 6 days per week, for commercial and industrial facilities every workday on which wastewater from the facility is introduced into the wastewater treatment facility.

w - weekly

m - monthly

y - yearly

c - continuously or per charge

REQUIRED ANALYSIS	Frequency Based on Volume of Wastewater		
	less than $10m^3$/day	from $10m^3$ to $100m^3$/day	from $100m^3$/day
Emulsion Decomposition Systems			
Inflow treatment component check to confirm no cyanide, nitrate, or chromate[1,2]	d	d	d
Outflow - check to confirm content of hydrocarbons, total	m	w	d
Cyanide, Nitrate, or Chromate detoxification			
Inflow treatment component check to confirm no cyanide, nitrate, or chromate	d	d	d
Outflow treatment component pH value, Redox value	c	c	c
Neutralization Systems			
Inflow treatment component check to confirm no cyanide, nitrate, or chromate	d	d	d
Outflow treatment component pH value	c	c	c
Precipitation and Flocculation Facilities			
Inflow treatment component check to confirm no cyanide, nitrite, or chromate[1,2]	d	d	d
Effect of treatment[3]			
COD_5 determination before and after treatment	2/year	m	w
Precipitation Facilities			
Outflow treatment component – visual depth	d	d	d
sludge mirror	m	m	m
Membrane-filtration Facilities			

Outflow treatment component - dullness, turbidity	c	c	c
Light or High Gravity Solid Separator/Grease Separator			
Sludge-catch / sludge level	m	m	m
Separator deposit/coat thickness	m	m	m
After treatment / controls	according to operating instructions		
Sludge Dewatering[4]			
Dry substance	m	m	w
Sludge formation	each drainage charge		
Sludge delivery	in accordance with rise/formation		
General Parameters[5]			
Wastewater rise	d	c	c
pH value	c	c	c
Temperature	w	d	c
Dullness, turbidity	-	c	c
BSB_5[6]	m	w	2/w
CSB[1]	m	w	d
Additional Parameters[5]			
Group 1: ammonia, nitrate, nitrite-nitrogen, phosphorus total, fluoride, iron, aluminum	m	w	d
Group 2: cyanide (easily releasable), chlorine sulfide, chrome VI, heavy metals except of iron	m	w	2/w
Group 3: adsorbable organic bonded halogens (AOX), hydrocarbons total, easilyvolatile halogenated hydrocarbons (LHKW),	2/y	4/y	m

Footnotes:

[1] Testing to confirm that substances are not in the wastewater need not be done if it can be shown that the process has no chance of introducing said substances into the waste stream.

[2] Testing need not be conducted if a test was conducted earlier in the waste stream and the process was found to be in compliance.

[3] As far as the treatment serves for the COD.

[4] Testing shall be done for mobile facilities/systems at least once per use.

[5] The tests indicated shall be conducted at the frequency indicated unless a valid permit specifies otherwise.

[6] Direct introduction in waters only.

C4.T44 Required Monitoring for Wastewater Facilities With a Biological Processing Phase in Hessen

Abbreviations:

d - daily
wd - every working day
w - weekly
m - monthly
c - continuously, record of 2-hour or 24-hour sum values of the flow

REQUIRED ANALYSIS	Size of the Wastewater Treatment Facility				
	< 1000 EW	**1000 to 5000 EW**	**5000 to 10,000 EW**	**10,000 to 100,000 EW**	**> 100,000 EW**
Inflow Facility					
Wastewater quantity				c; 2h	c; 2h
BOD_5	m	m	w	w	w
COD	m	m	w	w	w
NH_4-N				w	w
Kjeldahl-Nitrogen[3]		m	m	w	w
$N_{total\ inorganic}$ [1]		m	w	w	w
P_{total}		m	w	w	w
Outflow Biological Stage					
Temperature	wd	wd	wd	wd	wd
Outflow facility					
Wastewater quantity	c; 24h	c; 24h	c; 24h	c; 24h	c; 24h
BOD_5	m	w	w	w	w
COD	m	w	w	w[2]	w[2]
NH_4-N		m	w	d	d
Kjeldahl-Nitrogen[3]		m	m	m	m
$N_{total\ inorganic}$ [1]		m	w	d	d
P_{total}		m	w	d	d

Footnotes:

[1] Sum of Ammonium -, Nitrite and Nitrate Nitrogen ($N_{total\ inorganic}$)

[2] If subsequent denitrification with dosage of carbon carriers follows, additional continuously measurement of the inorganic pollution load

[3] Kjeldahl-Nitrogen (sum of $N_{organic}$ and NH_4-N)